SAMPLING AND ANALYSIS PLAN
REMOVAL ASSESSMENT OF HAYSTACK NO.1
ABANDONED URANIUM MINE

INCLUDING HAYSTACK NO.1, SECTION 24, AND BIBO TRESPASS

Navajo Nation, Haystack Chapter, McKinley County, New Mexico

TDD No.: 0002/1302-T2-R9-14-07-0001
Project No.: 20409.012.002.0009.00

July 2014

Prepared for:

United States Environmental Protection Agency
Emergency Response Section, Region 9
75 Hawthorne Street
San Francisco, California

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF APPENDICES

ABBREVIATIONS AND ACRONYMS

AEC	Atomic Energy Commision
AUM	Abandoned Uranium Mine
bgs	below ground surface
BLM	Bureau of Land Management
COPC	Contaminants of Potential Concern
cpm	counts per minute
DMP	Data Management Plan
DQI	Data Quality Indicators
DQO	Data Quality Objectives
EPA	United States Environmental Protection Agency
ERT	Environmental Response Team
FOSC	Federal On-Scene Coordinator
GIS	Geographical Information Systems
GPS	Global Positioning System
IDW	investigation-derived wastes
LCS	Laboratory Control Samples
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NNEPA	Navajo Nation Environmental Protection Agency
pCi/g	picocuries per gram
PRG	Preliminary Remediation Goal
PM	project manager
PPE	personal protective equipment
Ra-226	Radium 226
QA	Quality Assurance
QC	Quality Control
SAP	Sampling and Analysis Plan
SD	Standard Deviation
SOP	Standard Operating Procedures

START	Superfund Technical Assessment and Response Team
TDD	Technical Direction Document
TM	Task Monitor
WESTON	Weston Solutions, Inc.

1. INTRODUCTION

The United States Environmental Protection Agency (EPA) tasked Weston Solutions, Inc.'s (WESTON) Superfund Technical Assessment and Response Team (START) to conduct a removal assessment at the adjacently located Haystack No. 1, Section 24, and Bibo Trespass Abandoned Uranium Mine (AUM) sites in the Haystack Chapter of the Navajo Nation, McKinley County, New Mexico.

The removal assessment includes a comprehensive lateral ground surface gamma radiation survey at the AUM sites, an evaluation of vertical subsurface gamma radiation levels up to 10 feet below ground surface (bgs) at the AUM sites, an evaluation of typical background gamma radiation levels in the surrounding area, and collection of soil samples for Radium-226 (Ra-226) laboratory analysis.

This sampling and analysis plan (SAP) describes the project and data use objectives, data collection rationale, data quality assurance (QA) goals, and requirements for sampling and analysis activities. It also defines the sampling and data collection methods that will be used for this project. This SAP is intended to accurately reflect the planned data-gathering activities for this task; however, site conditions, budget, and additional EPA direction may warrant modifications. All significant changes will be documented in site records.

The specific field sampling and chemical analysis information in this SAP was prepared according to the following EPA documents: *EPA Requirements for Quality Assurance Project Plans, EPA QA/R 5, EPA/240/B 01/003 (EPA 2001), Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G 4, EPA/240/B-06/001 (EPA 2006), Guidance on Choosing a Sampling Design for Environmental Data Collection, EPA QA/G 5S, EPA/240/R02/005 (EPA 2002), and Uniform Federal Policy for Implementing Environmental Quality System, EPA/505/F-03/001 (EPA 2005).*

1.1 PROJECT ORGANIZATION

The following is a list of project personnel and their responsibilities.

EPA Task Monitor (TM) —The EPA TM is Federal On-Scene Coordinator (FOSC) Randy Nattis. Mr. Nattis is the primary decision-maker and will direct the project, specify tasks, and ensure that the project is proceeding on schedule and within budget. Additional duties include coordination of all preliminary and final reporting and communication with the Navajo Nation Environmental Protection Agency (NNEPA), START Project Manager (PM), EPA Environmental Response Team (ERT), EPA QA Office, and community residents. The EPA TM is also responsible for access to each property to be investigated.

START PM —The START PM is Mr. Alex Grubb. The START PM is responsible for implementing the SAP, coordination of project tasks and field sampling, project management, and completion of all preliminary and final reporting.

START QA Coordinator—Mr. Joe DeFao is the START QA coordinator. The QA Coordinator is responsible for the performance of tasks assigned by the START PM. Specifically, Mr. DeFao is responsible for the review of project objectives, review of this SAP, and coordinating plan-related activities with the EPA.

Principal Data Users —Data generated during the implementation of this SAP will be utilized by the EPA TM to make decisions regarding further action at the site, if necessary.

Analytical Laboratory Support —The START-contracted laboratory, Test America Inc., is responsible for sample analysis by definitive analytical methodologies. START is responsible for field data analysis and data validation of laboratory-generated data.

1.2 DISTRIBUTION LIST

Copies of the SAP will be distributed to the following persons and organizations:

- Randy Nattis, EPA Region 9 FOSC
- WESTON START Field Team
- WESTON START Project Files

1.3 STATEMENT OF THE SPECIFIC PROBLEM

The site consists of three adjacently located abandoned uranium mines, Haystack No.1, Bibo Trespass, and Section 24, that include an overlapping complex of former mine pits, ranging in size and scope. The three mines operated at the site from 1951 until 1981, and the workings were reclaimed in 1991. Field measurements collected in 2008 found elevated levels of gamma radiation throughout the site, at maximum levels more than 40 times the naturally occurring background levels. The full horizontal and vertical extent of the contamination has not been characterized.

One residence is located within the site boundary, and several others, including a church, are located with 0.25 miles of the site. The site is also currently used for livestock grazing.

The removal assessment area includes the boundaries of the three onsite mines, as well as adjacent areas where elevated gamma radiation have been encountered, or where gamma measurements have not been collected. The three AUMs have a total combined area of 118 acres, but the overall extent of the assessment area is estimated to be between 120 and 180 acres. The lateral extent of the removal assessment will be determined based on field measurements and observations.

2. SITE BACKGROUND

2.1 SITE LOCATION

The site is located on the Haystack Butte, approximately 500 feet south of Haystack Mountain, within the Baca/Haystack Chapter of the Navajo Nation, approximately five miles east of Prewitt, New Mexico. The removal assessment boundary consists of the former pit mine operation area, as well as other adjacent areas where surface gamma radiation activity has been detected at levels greater than 25 times the previously reported background levels.

The site consists of three abandoned uranium mines (AUMs), Haystack No.1, Bibo Trespass, and Section 24, also known as Nan-a-bah Vandever. The individual AUM site locations are detailed below:

Haystack No. 1 AUM

- The Haystack No. 1 AUM site has an approximate area of 69 acres, and comprises the eastern portion of the assessment area. The geographical center of the site is located at Latitude / Longitude 35.3457135782 N / -107.943650564 W, in the northwest quarter of Section 19 of Township 13 N, Range 10 W.

Bibo Trespass AUM

- The Bibo Trespass AUM site has an approximate area of 22 acres, and comprises the northwestern portion of the assessment area. The geographical center of the site is located at Latitude / Longitude 35.3495228711 N / -107.94863969 W, in the southeast quarter of Section 13 of Township 13 N, Range 11 W.

Section 24 AUM

- The Section 24 AUM site has an approximate area of 27 acres, and comprises the southwestern portion of the assessment area. The geographical center of the site is located at Latitude / Longitude 35.3465449599N / -107.947928184 W, in the northeast quarter of Section 24 of Township 13 N, Range 11 W.

The site location is shown on Figure 2-1, included in Appendix A.

2.2 SITE DESCRIPTION

The site consists of three adjacently located abandoned uranium mines, Haystack No.1, Bibo Trespass, and Section 24, and includes an overlapping complex of former pits created to mine uranium from the naturally occurring Jurassic Todilto Limestone deposits. The three AUMs have a total combined area of 118 acres. The site is used for livestock grazing, and one residence is located within the AUM boundary of Haystack No.1, while several others, including a church, are located with 0.25 miles of the site.

The three onsite AUMs are located atop the Haystack Butte, with the edge of the cliff running alongside the southern boundary of the site. Mining waste was reportedly pushed off the bench at a nearby site, and the same activities may have taken place at the onsite AUMs. The site is relatively flat, with an av erage slope ranging from 2 to 8 percent . The topography of the site drains into the Rio San Jose receiving basin. Site soils have been described as a fine sandy loam at the surface, a sandy clay loam to 14 inches bgs, and a cobbly sandy loam from 14 to 24 inches bgs.

The removal assessment area includes the boundaries of the three onsite AUMs, as well as adjacent areas where elevated gamma radiation has been encountered. The three AUMs are described below:

Haystack No. 1 AUM

- The Haystack No. 1 AUM is the largest of the three mine sites at 69 acres, and was operational from 1951 to 1981. The AUM is loc ated on both Indian Allotment and private land owned by S. Fart hree and McKinge n, with the mineral rights owned by t he Newmont Mining Corporation. The worked area extends throughout the AUM, and included an unspecified number of mine pits ranging in size, with a reported maximum depth of 60 feet below ground surface (bgs). The pits were reportedly reclaimed from 1990 to 1991, and are no longer present at the site. The AUM was screened in 2008 for surface gamma radiation, where elevated readings were found throughout the site, including approximately 40 times the naturally occurring background levels near the onsite residence.

Bibo Trespass AUM

- The Bibo Trespass AUM is the smallest of the three mine sites at 22 acres, and was operational from 1951 to 1981. The AUM is located on federal land owned by the Bureau of Land Management (BLM), with the mineral rights also owned by BLM. The worked area included a pit in the southeast corner of the site, which was an extension of a pit mined at the Haystack No.1 AUM. The pit was reportedly reclaimed from 1990 to 1991, and is no longer present at the site. The AUM was screened in 2008 for surface gamma radiation, where elevated readings were found highest along the dirt road transecting the site, more than five times the naturally occurring background levels.

Section 24 AUM

- The Section 24 AUM, commonly known as "Nan -a-bah Vandever" comprises 27 acres, and was operational from 1952 to 1957. The AUM is located on Indian Allotment land , with Indian Allotment mineral rights . The workings in the northeast portion of the AUM reportedly included a 900 feet long by 300 feet wi de area where the top 10 feet was stripped, and at least three pits were dug to a maximum depth of 15 to 20 feet bgs. Overburden limestone was reportedly piled throughout the workings, and a small mine dump was located in the center of the pits. The pits were reportedly reclaimed in 1990 and are no longer present at the site. The AUM was screened in 2008 for surface gamma radiation, where elevated readings were found throughout the site, including levels measured at more than 25 times the naturally occurring background levels.

Five other AUMs are located within 0.25 miles of the site, including two AUMs named "Section 18", approximately 700 feet and 900 feet northeast of Haystack No.1, and three named "Haystack", approximately 30 feet north, 100 feet northwest, and 350 feet northeast of Bibo Trespass.

The site layout is shown on Figure 2-2, included in Appendix A.

2.3 SITE HISTORY

The site is comprised of three adjacently located former uranium mine sites that were among 31 sections of land mined from the Jurassic Todilto Limestone deposits in the Grants Uranium district of New Mexico. The Todilto Limestone deposits were one of few places in the world where commercially viable uranium was found within limestone formations. The Todilto deposits were mined from 1950 to 1981, and produced a total of approximately 3,300 tons of U_3O_8. The Haystack No.1 AUM, also known as "Haystack-Section 19 Open Pit Complex", was operational from 1951 to 1981, with a total production volume of approximately 335 tons of U_3O_8. The Bibo Trespass AUM, also known as "Section 13", was operational from 1951 to 1981, with a total production volume of approximately 8.5 tons of U_3O_8. The Section 24 AUM, also known as "Nan-a-bah Vandever" and "Glen and Edith", was operational from 1952 to 1957, with a total production volume of approximately 58 tons of U_3O_8.

In 1950, a Navajo sheepherder name Paddy Martinez discovered uranium deposits in the limestone at foot of Haystack Butte, in Section 19 of Township 13N Range 10W, at the current location of the Haystack No.1 AUM. The mineral rights at the discovery site were owned by Sante Fe Pacific Railroad, who promptly began drilling, sampling, and test pitting on November 21, 1950, where a sellable grade of U_3O_8 was encountered in Section 13 of Township 13N Range 11W, the current location of the Bibo Trespass AUM. Sante Fe made the first shipments in 1951 to the Atomic Energy Commission (AEC) buying station in Monticello, Utah.

In 1952, Sante Fe formed the Haystack Mining Development Company and began large scale exploration. By 1955, 44% (231 tons) of the ore produced from the Todilto deposits came from the stockpiles within Section 19 (Haystack No.1).

In 1952, Glenn D. Williams acquired the lease (I-149-Ind-8912) to 160 acres of Section 24 of Township 13N, Range 11W, on the Nan-a-bah Vandever Indian Allotment. Glenn Williams mined the site until 1954, when Sante Fe Uranium reportedly took over operations.

In 1954, Public Land Order 964 mandated the public withdrawal from mining within several land sections for the purpose of exploration by AEC, which included Section 13 (Bibo Trespass). From 1956 to 1961, Art Bibo mined ore from the open pit at Section 13, and was found in court to be trespassing at the site. In 1974, AEC officially leased Section 13.

The peak of the Todilto deposit mining was in 1959, when more than 293 tons of U_3O_8 was produced and sold to the local Anaconda Bluewater buying station, who announced they would no longer be accepting ore after May of 1959. Following the closure of the Anaconda-Bluewater station, the Haystack Mining Development Company sent ore to Homestake-New Mexico and Phillips Petroleum Company Mills.

In 1974, AEC sold the Section 13 (Bibo Trespass) lease to George Warnock , who commenced mining under lease NM -B-1. By 1976, the lease was reassigned to the Todilto Exploration and Development Company, who also mined the Haystack No. 2 site, approximately 0.25 miles west of the Bibo Trespass AUM.

By 1981, declining prices of uranium eventually led to the closure of the Todilto deposit mines.

All three AUMs were reportedly reclaimed between 1990 and 1991. The mines appear to have been reclaimed by Newmont Mining Corporation /Sante Fe Pacific Railroad under an EPA action, starting in 1990 and concluding in 1991. The reclamation included the backfilling of pits, removal of debris, and limited fencing and signage.

2.4 DESCRIPTION AND DISTRIBUTION OF MINE WASTE

The site consists of three adjacently located abandoned uranium mines , Haystack No.1, Bibo Trespass, and Section 24, that include an overlapping complex of former mine pits, ranging in size and scope . The site is currently used for livestock grazing, and one residence is located within the AUM boundary of Haystack No.1, while several others, including a church, are located with 0.25 miles of the site.

The removal assessment area includes the boundaries of the three onsite AUMs, as well as adjacent areas where elevated gamma radiation has been encountered. The three AUMs have a total combined area of 118 acres, but the overall extent of the assessment area is estimated to be between 120 and 180 acres. The lateral extent of the removal assessment will be determined during field activities, based on field measurements and observations.

Based on gamma radiation screening levels collected in 2008, the removal assessment will likely include the following areas of concern:

- Haystack No.1 AUM: Historical pits were located throughout the AUM, and elevated gamma levels were found across the site, including approximately 40 times the naturally occurring background levels near the onsite residence

- Bibo Trespass AUM : A historical pit was located in the southeast corner of the AUM, and elevated gamma levels were found highest along the dirt road transecting the site, more than five times the naturally occurring background levels

- Section 24 AUM: Historical workings were found in the northeast portion of the AUM, and elevated gamma were found across the site, including levels measured at more than 25 times the naturally occurring background levels

- Offsite Delineation Areas (Elevated Gamma Levels): Elevated gamma levels along the AUM boundaries where the horizontal extent of contamination has not yet been determined, including the northern , eastern, and southern boundaries of the Haystack No.1 AUM, as well as limited portions of the Section 24 and Bibo Trespass AUM boundaries

- Offsite Areas of Concern (Unknown Gamma Levels): Gamma levels have not been measured at some areas of specific concern near the AUMs, including along the bottom of the cliff area south of the site, and along the access roads and residences northeast of the site.

The 2008 gamma radiation measurements and areas of concern are shown on Figure 2 -2, included in Appendix A.

3. PROJECT OBJECTIVES

3.1 PROJECT TASKS AND SAMPLING OBJECTIVES

The EPA tasked START to prepare this SAP to support the environmental data collection activities needed to document implementation and completion of the removal assessment. The purpose of data collection procedures presented in this SAP is to determine the number, location, and type of proposed sampling; field sample collection and laboratory analytical methods and procedures; and data quality assurance and validation procedures. The primary objectives for this AUM removal assessment are to generate definitive and screening level data that will be utilized to:

1. Determine the potential threat to human health or the environment from AUM waste (assessed as elevated gamma activity levels) at the site which exceed the proposed action level protective of human health;
2. Determine the lateral ground surface boundaries where elevated gamma radiation activity is present at the site;
3. Evaluate the vertical subsurface extent (up to 10 feet bgs) where elevated gamma radiation activity is present at the site; and
4. Determine the typical background levels for gamma radiation activity in areas surrounding the site.

3.2 INVESTIGATION AND ACTION LEVELS

The investigation level for gamma radiation activity in soils will be based on field identified background levels and represented in counts per minute (cpm). Ra-226 is the contaminant of potential concern (COPC) at the site. The action level for Ra-226 in soil will be based on the sum of the background concentration of Ra-226 and the EPA Preliminary Remediation Goal (PRG) of 1.21 picocuries per gram (pCi/g). The PRG is based on Ra-226 and its daughter progeny in residential soil and an estimated excess cancer risk of 1 in 10,000 (10^{-4}) (EPA 2010). Exposure pathways considered include incidental ingestion of soil, inhalation of particulates emitted from soil, external exposure to ionizing radiation, and consumption of fruits and vegetables. This standardized PRG is based on default exposure parameters and incorporate exposure factors that present reasonable maximum exposure selected to be protective of human health for most site conditions. The investigation and action levels are presented in Table 3-1.

Table 3 -1. Benchmarks and Data Quality Indicator Goals

Analyte	Background Concentration[1]	Site-Specific Action Level	EPA PRG (pCi/g)	Reporting Limit	Accuracy (% Recovery for MS/ MSD)	Precision (RPD from MS/MSD and Duplicates)	Percent Completeness
Gamma radiation activity[2]	To be determined (cpm)	Background (cpm)	NA	0.1 cpm with a detection range from 0.1 to 999,000 cpm	NA	20%	90
Ra-226	To be determined (pCi/g)	Sum of Background and EPA PRG (pCi/g)	1.21	1.00 (pCi/g) Test America – St. Louis	NA	35%	90

Notes:

cpm	count per minute
EML	Environmental Measurements Laboratory
HASL	Health and Safety Laboratory
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NA	Not applicable
pCi/g	picocuries per gram
PRG	EPA Preliminary Remediation Goal (August 2010)
Ra-226	Radium isotope number 226
RPD	Relative Percent Difference
1	Background gamma radiation activity and Ra -226 conce ntration in soil will be determined during field activities and laboratory analysis.
2	All field instruments will be included in the quality control program to document that the instruments are operating within specified control limits. The background and gamma source control limits will be established based on plus or minus 20 percent of the respective average activity rates, determined according to the instrument field operating procedures.

3.3 DATA QUALITY INDICATORS (DQIS)

Data quality indicators (DQIs) are defined as: precision, accuracy, representativeness, completeness, comparability, and method detection limits. The DQIs for this project were developed following the guidelines in the EPA Requirements for Quality Assurance Project Plans (EPA 2001). All ga mma radiation survey and soil sampling procedures are documented in Sections 6.2 through 6.5. Standard operating procedures (SOPs) will be followed to ensure representativeness of gamma radiation survey and soil sample results by obtaining characteristic measurements and samples. Approved EPA methods and standard reporting limits will be used whenever possible. All data not rejected will be considered complete. Table 3 -1 documents the site-specific DQI goals for the COPCs.

3.4 DATA QUALITY OBJECTIVES (DQOS)

The DQO process as set forth by U.S. EPA guidelines (U.S. EPA 2006) was followed to establish the DQOs for this project. Based upon the DQO process, this removal assessment will involve the generation of quantitative field screening data to document gamma rad iation activity levels in surface and subsurface soils, and AUM waste. Additionally, this removal assessment will involve the generation of quantitative definitive analytical data to document Ra -226 concentrations in surface and subsurface soils. Analytica l methods approved by the EPA will be used to generate all field screening and definitive analytical data used to support this removal assessment. The specific requirements for field screening and definitive analytical data are detailed in Section 9.0.

3.5 SCHEDULE OF FIELD ACTIVITIES

Field activities are anticipated to begin on August 11, 2014 and continue for up to 10 days.

3.6 SPECIAL TRAINING REQUIREMENTS/CERTIFICATIONS

The operation of the field analytical instruments requires specialized training that will be administered, prior to mobilization, to all START personnel scheduled to be on site.

Field sampling personnel should be trained and have experience with soil sampling at hazardous waste sites while wearing appropriate protective equipment. One field sampl er will be trained and familiar with Global Positioning System (GPS) data collection. All sampling personnel will have appropriate training that complies with 29 Code of Federal Regulations 1910.120. The site - specific health and safety plan for this project is included in Appendix C.

Analytical laboratories and laboratory personnel require specialized training, certification and experience. WESTON project management must determine and verify these requirements prior to the use of any laboratory resource(s) . Data validation requires specialized training and experience. The START quality control (QC) Coordinator will determine and verify a qualified data validation resource prior to data validation.

4. SAMPLING RATIONALE AND DESIGN

The START reviewed available site information including previously collected gamma radiation data, and the EPA's objectives for this removal assessment , to determine a specific sampling design. The following sections describe the specific sampling designs that will be implemented during this removal assessment. The number of samples to be collected and the analyses to be performed are presented in Table 5-1.

4.1 DETERMINATION OF BACKGROUND

Background gamma radiation surveys and Ra -226 sampling and analysis are required to determine naturally-occurring gamma radiation and COPC concentrations in an area with similar geology and no known or suspected impacts from mining. The background area will be selected in the field according to the Background Location Selection Criteria (NNEPA and E PA 2010). The background area will be easily accessible, an appropriate distance from the site, and historically undeveloped based on visual observation.

4.1.1 Background Gamma Radiation Investigation Level

A gamma radiation survey unit measuring 50 feet by 50 feet will be established in the selected background location. Gamma radiation in surface soil will be measured using a paire d Ludlum Model 2241 meter and Model 44-20 (3 inch by 3 inch) detector positioned 6 inches above the ground surface. The VIPER syst em, a Trimble GeoXT6000 GPS, and geographic information system (GIS) will be used for geospatial information collection and analysis. The background survey unit will consist of transects spaced three feet apart, which will provide 99 to 100 percent characterization of the site. The transect width is based on the field of view of the detector which is 3 to 6 feet diameter. The surveyor will walk at a pace of 3 feet per second. The mean and standard deviation (SD) of the gamma radiation measurements in the background surface soil will be calculated to develop the investigation level for gamma radiation at the site. An acceptable background area will have a low mean and SD.

4.1.2 Background Soil Sampling Ra-226 Action Level

Four discrete surface soil samples and two co-located subsurface samples will be collected in the background survey unit at locations selected at random, from 0 to 6 inches bgs (surface) and at subsurface depths based on down -hole gamma scanning findings . The soil samples will be analyzed for Ra -226 by EML HASL 300 4.5.2.3 method. The sample data will be used to develop the site action level for Ra -226. Co-located one-minute static gamma radiation counts will also be collected from 6 inches above the ground surface for each sample, and at regular depth intervals for subsurface samples at each location . These static gamma radiation counts serve to establish a relationship between gamma radiation measurements (cpm) and Ra -226 concentrations in soil.

Subsurface soil core samples will be collected using an EPA-supplied direct-push drill rig with disposable acetate liners. The sampling rig will be advanced to a borehole depth of 10 feet bgs. Following the removal of the soil core, a Ludlum 44-62 (0.5x1) paired with a Ludlum 2221 meter will placed in a thin -walled PVC (or simila r) pipe with a lead -shielded base and lowered into the borehole to collect static gamma measurements at regular intervals. If START is able to procure an automated down-hole gamma logger (2MGA-1000 or similar), the equipment will be tested in addition to the method described above, and results will be compared accordingly.

4.2 AUM SITE SURFACE SOILS

Based on gamma radiation screening levels collected in 2008, the removal assessment will likely include the investigation of between 120 and 180 acres of site soils across the following areas of concern:

- Haystack No.1 AUM: Historical pits were located throughout the AUM, and elevated gamma levels were found across the site, including approximately 40 times the naturally occurring background levels near the onsite residence

- Bibo Trespass AUM: A historical pit was located in the southeast corner of the AUM, and elevated gamma levels were found highest along the dirt road transecting the site, more than five times the naturally occurring background levels

- Section 24 AUM: Historical workings were found in the northeast portion of the AUM, and elevated gamma were found across the site, including levels measured at more than 25 times the naturally occurring background levels

- Offsite Delineation Areas (Elevated Gamma Levels): Elevated gamma levels along the AUM boundaries where the horizontal extent of contamination has not yet been determined, including the northern, eastern, and southern boundaries of the Haystack No.1 AUM, as well as limited portions of the Section 24 and Bibo Trespass AUM boundaries

- Offsite Areas of Concern (Unknown Gamma Levels): Gamma levels have not been measured at some areas of specific concern near the AUMs, including along the bottom of the cliff area south of the site, and along the access roads and residences northeast of the site

4.2.1 Surface Gamma Radiation Scanning

Gamma radiation in surface soil at the site will be measured using methods similar to those used when measuring gamma radiation in the background area. Two VIPER/GPS/GIS-linked Ludlum Model 2241 meters and Model 44-20s (3 inch by 3 inch) will be positioned 6 inches above the ground surface and mounted to a trailer pulled by an all-terrain vehicle (ATV). The surface soil gamma radiation survey will be conducted using this vehicle, which will execute approximately 5-foot wide transects at a pace of 3 feet per second, and will cover 99 to 100 percent of the site.

If gamma radiation measurements along the perimeter of the site exceed the investigation level, lateral step-out delineation will continue beyond the current site boundary until the recorded gamma radiation measurements are below the identified investigation level. If the area of contamination continues into the site boundaries of the other nearby offsite AUMs, the scan will be concluded at the offsite AUM boundary.

It is estimated that between 120 and 180 acres will scanned during the removal assessment.

4.2.2 Surface Soil Sampling

In addition to the four background surface soil samples detailed in Section 4.1.2, up to 15 surface soil samples will be collected at the site and analyzed for Ra -226 by EML HASL 300 4.5.2.3 method. Surface soil samples will be co -located with one -minute static gamma radiation counts to establish a relationship between Ra -226 concentrations and gamma radiation measurements (cpm) in soil. Surface soil samples will b e collected from 0 to 6 inches bgs from locations where gamma radiation measurements are above the investigation level according to the following ranges:

- Investigation level plus 10,000 cpm
- Investigation level plus 20,000 cpm
- Investigation level plus 30,000 cpm
- Investigation level plus 50,000 cpm

Surface soil samples will be collected from locations within the ranges of interest in each soil type and vegetation cover observed at the site. All sample information will be logged in the electronic data collection device, photographed, and marked with a GPS.

Two duplicate samples (or 10% of total samples) will be collected and given false sample IDs for the purpose of QA/QC. Additional surface soil samples may be collected based on field observations.

4.3 AUM SITE SUBSURFACE SOILS

Subsurface soils will be investigated at the site to determine the vertical extent of the removal area. Gamma radiation in subsurface soil will be assessed to an estimated 10 feet bgs throughout the area determined by the horizontal surf ace investigation described in Section 4.2. Downhole gamma scanning and limited subsurface soil sampling will be completed at the site.

4.3.1 Subsurface Gamma Radiation Scanning

As described above in Section 4.1.2, subsurface soil will be scanned by advancing a borehole to a subsurface depth of approximately 10 feet bgs . To collect static gamma radiation measurements, a Ludlum 44-62 probe (0.5 inch by 1 inch) paired with a Ludlum 2221 meter will be placed within a thin-walled PVC (or simil ar) pipe with lead -shielded base and lowered into the borehole.

Using Visual Sampling Plan (VSP) software, an estimated number of 105 soil borings were distributed across the site to evaluate the vertical extent of contamination. An estimated 75 borings are located within the AUM boundaries, and an estimated 30 borings are located with in the offsite delineation areas.

If START is able to procure a n automated down -hole gamma logger (2MGA -1000 or similar), the equipment will be test in addition to the method described above, and results will be compared accordingly.

Subsurface locations are shown on Figure 4-1, located in Appendix A.

4.3.2 Subsurface Soil Sampling

In addition to the two background subsurface soil samples detailed in Section 4.1.2, up to 10 subsurface soil samples will be collected at the site and analyzed for Ra-226 by EML HASL 300 4.5.2.3 method. Subsurface sample locations will be co-located with 10 surface sample locations.

Subsurface soil samples will be collected using an EPA-supplied direct -push drill rig, with disposable acetate liner s. The borehole will be advanced to a depth of 10 feet bgs , and the disposal sleeves containing the soil cores will be place on a plastic -sheet lined table and labeled. Following the removal of the soil core, a Ludlum 44 -62 (0.5 inch by 1 inch) paired with a Ludlum 2221 meter will be placed within a thin-walled PVC (or similar) pipe with lead-shielded base and lowered into the borehole to collect static gamma measurements . Based on the static gamma radiation measurements at regular depth intervals , the soil sample depth will be determined, and the sample will be collected directly from the core.

All sample and geological lithography information will be logged in the electronic data collection device, photographed, and marked with a GPS. Sampling equipment will be decontaminated in accordance with SOP #2006.

Two duplicate samples (or 10% of total samples) will be collected and given false sample IDs for the purpose of QA/QC. Additional surface soil samples may be collected based on field observations.

4.4 CONTAMINANTS OF CONCERN

Gamma radiation in surface and subsurface soil at the site will be measured in cpm. Soil samples will be analyzed for Ra -226 as an indicator isotope to determine the extent of contamination from historical uranium mining at the site. Gamma radiation measurements will be cor related with the Ra-226 concentrations detected in soils at the background and site locations.

5. REQUEST FOR ANALYSES

Gamma radiation will be measured at the selected background location, over the entire site surface area, and at approximately 105 subsurface vertical borings up to 10 feet bgs. Soil samples collected from these locations will be analyzed for Ra-226 concentrations by a START-contracted laboratory. The following sections describe these analyses.

5.1 FIELD ANALYSIS

Gamma radiation in surface soil will be measured in the field using a paired Ludlum Model 2241 meter and a Model 44-20 (3 inch by 3 inch) detector. Operational checks will be conducted on the paired meter and detector combinations before the field activities using a check source with 1 or 5 microcuries of Cesium-137. The optimal high voltage setting for the instrument will be set using a Fluke voltage meter. The meter combination(s) used for soil surveys will be linked to a VIPER system for geospatial information collection and analysis.

To provide QC for the field analytical effort, the following measures will be utilized:

- Analytical precision and sensitivity of the gamma radiation survey equipment will be established before beginning the field measurements and will be verified throughout the field survey through operational and background checks.
- Whenever possible, the same paired VIPER-linked meter and detector used to establish the relationship between gamma radiation activity and Ra-226 concentrations in soil will be used for all surveys conducted at the site.

5.2 LABORATORY ANALYSIS

Soil samples will be analyzed for Ra-226 by EML HASL Method 300 4.5.2.3 (Department of Energy 1990). Soil samples will be submitted to Test America - St.Louis. Sample containers, preservatives, holding times, and estimated number of soil confirmation and quality control samples are summarized in Table 5-1.

Upon receipt of sample results, 20 % of all results will be sent to an accredited third party validator will be sent to a third party validator, and all sample results will be reviewed by a START certified health physicist.

To provide quality control for the analytical program, the following measures will be utilized:

- Duplicate samples will be collected from 10 percent of the soil sampling locations or one per sample design group. Duplicate soil samples will be collected as a 50/50 split of the sample after collection and homogenization.
- If non-dedicated sampling equipment is used to collect soil samples at the site, a rinsate blank will be collected at a rate of one per day to evaluate decontamination procedures. The rinsate blank will be collected by pouring deionized water over the decontaminated sample collection device (e.g., trowel or hand auger) and capturing the water in the specified sample container.

Table 5-1. Sampling and Analysis Summary

Method	Gamma Radiation Survey	Ra-226 by EML HASL 300 4.5.2.3
Sample Container	None	8 ounce plastic soil
Preservation	None	None
Analysis Holding Time	None	6 months
Estimated Number of Unique Discrete Samples	105	19 surface soil samples 12 subsurface soil samples
Estimated Number of Duplicate Samples	NA	4
Minimum Total Site Sample Analyses	NA	35

Equipment Rinse Blanks (if non-dedicated equipment is used)	
Sample Container	500 milliliter plastic bottle
Preservation	-4 °C
Analysis Holding Time	14 days
Number of Samples	1 per day

Sample ID	Sample Depth (ft)	Description	Sample ID	Sample Depth	Description
BG-01-A	0 - 0.5	Background	SS-09-A	0 - 0.5	Section 24
BG-02-A	0 - 0.5	Background	SS-10-A	0 - 0.5	Section 24
BG-02-B	TBD[1]	Background	SS-10-B	TBD[1]	Section 24
BG-03-A	0 - 0.5	Background	SS-11-A	0 - 0.5	Offsite
BG-03-B	TBD[1]	Background	SS-12-A	0 - 0.5	Offsite
BG-04-A	0 - 0.5	Background	SS-12-B	TBD[1]	Offsite
SS-01-A	0 - 0.5	Haystack No. 1	SS-13-A	0 - 0.5	Offsite
SS-01-B	TBD[1]	Haystack No. 1	SS-14-A	0 - 0.5	Offsite
SS-02-A	0 - 0.5	Haystack No. 1	SS-14-B	TBD[1]	Offsite
SS-02-B	TBD[1]	Haystack No. 1	SS-15-A	0 - 0.5	Offsite
SS-03-A	0 - 0.5	Haystack No. 1	SS-15-B	TBD[1]	Offsite
SS-04-A	0 - 0.5	Haystack No. 1	SS-16-A	0 - 0.5	Duplicate
SS-04-B	TBD[1]	Haystack No. 1	SS-16-B	TBD[1]	Duplicate
SS-05-A	0 - 0.5	Bibo Trespass	SS-17-A	0 - 0.5	Duplicate
SS-05-B	TBD[1]	Bibo Trespass	SS-17-B	TBD[1]	Duplicate
SS-06-A	0 - 0.5	Bibo Trespass	EB-01	-	Rinsate
SS-06-B	TBD[1]	Bibo Trespass	EB-02	-	Rinsate
SS-07-A	0 - 0.5	Bibo Trespass	EB-03	-	Rinsate
SS-08-A	0 - 0.5	Section 24	EB-04	-	Rinsate
SS-08-B	TBD[1]	Section 24	EB-05	-	Rinsate

1 Subsurface depths will be determined based on field observations

6. FIELD METHODS AND PROCEDURES

6.1 FIELD PROCEDURES

The following sections describe field procedures and equipment used during the site activities.

6.1.1 Equipment

The equipment listed below may be utilized to obtain environmental samples from the respective media according to the following sampling standard operating procedures (SOPs) or their equivalent:

- Ludlum Model 44-20
- Ludlum Model 2241
- VIPER system, training and procedures
- Trimble GeoXT 6000
- Environmental Response Team SOP #2012 Soil Sampling
- ERT SOP #2006 Sample Decontamination

The following is a partial list of equipment that may come in contact with samples:

- GeoProbe stainless steel rod
- Dedicated plastic liners
- Dedicated plastic scoops
- Dedicated plastic sample jars or sealable plastic bags
- Disposable nitrile gloves

6.1.2 Equipment Maintenance

Field instrumentation for the collection of soil samples will be operated, maintained, and have operational checks conducted by the sampling team according to the SOPs listed in Section 6.1.1 or their equivalent. Field instrumentation utilized for health an d safety purposes will be operated, maintained, and have operational checks conducted by the sampling team according to the manufacturer's instruction. Operational checks and field use data will be recorded in th e instrument or field logbooks.

6.1.3 Inspection/Acceptance Requirements for Supplies and Consumables

There are no project -specific inspection/acceptance criteria for supplies and consumables. It is standard operating procedure that personnel will not use broken or defective materials; items will not be u sed past their expiration date; supplies and consumables will be checked against order and packing slips to verify the correct items were received; and the supplier will be notified of any missing or damaged items.

6.1.4 Field Logbooks

Field logbooks will document where, when, how, and from whom any vital project information was obtained. Logbook entries will be complete and accurate enough to permit reconstruction of field activities. Logbooks are bound with consecutively numbered pages. Each page will be dated and the time of entry noted in military time. All entries will be legible, written in ink, and signed by the individual making the entries. Language will be factual, objective, and free of personal opinions. The following information will be recorded, if applicable, during the collection of each sample:

- Sample location and description
- Property sketch showing sample, removal excavations, and in-place capping locations with measured distances
- Sampler's and documenter's name(s)
- Date and time of sample collection, removal excavation, and in-place capping occurred
- Type of samples, excavated, or capped material
- Type of sampling equipment used and matrix
- Field observations and details (e.g., rain, odors, etc.)
- Field instrument reading
- Shipping arrangements (air bill numbers)
- Receiving laboratory(ies)

START team members will be on site performing different duties related to sample collection, processing, and analysis. Each logbook will document the information relevant to the site radiation activity, and at a minimum will include:

- Team members and their responsibilities
- Time of activities
- Deviations from sampling plans, site safety plans, and SAP procedures
- Levels of safety protection
- Calibration information
- Analytical data

6.1.5 Photographs

Photographs will be taken at representative sampling locations and at other areas of interest on site. They will serve to verify information entered in the field logbook. When a photograph is taken, the following information will be recorded in the appropriate field logbook or tablet:

- Time, date, location, and, if appropriate, weather conditions
- Description of the subject photographed
- Name of person taking the photograph

6.1.6 Electronic Sample Logging

The sampling team may utilize field management software to prepare sample labels and chain-of-custody forms. Blank sample labels and chain-of-custody forms will also be available. The following information should be entered for each sample after collection:

- Sample name
- Sample date and time
- Number of Sample bottles
- Type of Preservation
- Analyses

In addition to these items, the software may also be used to keep track of other information such as sample depth, field measurements, and split samples. The field team will generate chain-of-custody forms for each cooler of samples packaged and sent to a laboratory. Each chain-of-custody form will refer to the shipping method and tracking number. Printed chain-of-custody forms will be submitted to the laboratory with the samples. The use of field management software will require that the field team have access to a computer, a printer, computer paper, and labels while in the field. The field data manager will be responsible for implementing the software.

The data management plan (DMP) is included as Appendix D.

6.1.7 Mapping Equipment

Sample points and site features will be located and documented with a GPS unit. The GPS will be used to assign precise geographic coordinates to sample locations on the site. GPS mapping will be done by personnel trained in the use of the equipment and will be completed according to the manufacturer's instructions. Expected output from the use of GPS mapping will be site maps with sample locations and major site features.

6.2 BACKGROUND LOCATION SURVEY PROCEDURES

The background location will be selected in the field according to the Background Location Selection Criteria (NNEPA and EPA 2010) as follows:

- Similar elevation as the site
- Similar geology as the site
- Avoid areas of naturally-occurring uranium
- Upwind (gradient, stream) from site
- Undisturbed with natural vegetation
- Not in drainage or area impacted by flooding
- Distance to residential structures (structures should be within range of vision)
- Accessible (by vehicle and equipment)
- Should not be near a mine site or similar contaminant source

- If possible, avoid anthills and rodent holes
- Ask nearby residents about area

A gamma radiation survey unit measuring 50 feet by 50 feet will be established in the selected background location. Gamma radiation in surface soil will be measured using a paired Ludlum Model 2241 meter and Ludlum Model 44-20 (3 inch by 3 inch) detector positioned 6 inches above the ground surface. The VIPER system, a Trimble GeoXT6000 GPS, and GIS will be used for geospatial information collection and analysis. The background survey unit will consist of transects spaced 3 feet apart, which will provide 99 to 100 percent characterization of the site. The transect width is based on the field of view of the detector which is 3 to 6 feet diameter. The surveyor will walk at a pace of 3 feet per second. The mean and SD of the gamma radiation measurements in the background surface soil will be calculated to develop the investigation level for gamma radiation at the site. An acceptable background area will have a low mean and SD.

6.2.1 Background Soil Sampling

Four discrete surface soil samples and two co-located subsurface soil samples will be collected in the background survey unit at random locations. Surface soil samples will be collected from a depth of 0 to 6 inches bgs, and subsurface sampling depths will be based on down-hole gamma scanning findings. The soil samples will be analyzed for Ra-226 by EML HASL 300 4.5.2.3 method. The sample data will be used to develop the site action level for Ra-226. Additionally, co-located one-minute static gamma radiation counts will be collected at each location to establish a relationship between gamma radiation measurements (cpm) and Ra-226 concentrations in soil; from 6 inches above the surface of the ground and at regular depth intervals for subsurface samples at each location.

Subsurface soil samples will be collected using an EPA-supplied direct-push drill rig, with disposable acetate liners to collect soil cores. The borehole will be advanced to 10 feet bgs. Following the removal of the soil core, a Ludlum 44-62 detector (0.5 inch by 1 inch) paired with a Ludlum 2221 meter will be placed within a thin-walled PVC (or similar) pipe with lead-shielded base, and lowered into the borehole to collect static gamma measurements at regular depth intervals. If START is able to procure an automated down-hole gamma logger (2MGA-1000 or similar), the equipment will be test in addition to the method described above, and results will be compared accordingly.

Soil samples will be collected using a disposable trowel and placed into a dedicated 8-ounce plastic sample jar or plastic sealable bag. If present, non-soil material including rocks larger than approximately ½-inch median diameter will be removed from the soil sample. Sample jars will be stored in a cooler according to the laboratory requirements in Table 5-1.

All sample locations will be recorded in the field logbook as sampling is completed. Each field sampling team will document each individual sampling location in the logbook, which includes: the site name, where the sample was collected with a representative sketch of the area, GPS coordinates of the sample location, date, time, sample identification (ID), sampling team members, and photographs taken.

Samples will be shipped to the laboratory for Ra -226 analysis using the EML HASL 300 4.5.2.3 method at the end of field activities. Sampling equipment will be decontaminated after every sample according to Section 6.6.

6.3 SURFACE GAMMA RADIATION SURVEY PROCEDURES

The survey equipment for measuring gamma radiation consists of a paired Ludlum Model 2241 meter and Model 44 -20 (3 inch by 3 inch) detector linked to a VIPER syste m which will have operational checks conducted before field activities. Performance of the radiation survey equipment will be verified throughout the field activities through operational checks and background checks as necessary. Whenever possible, the sam e paired gamma activity survey system will be used for all surveys conducted at the site.

The paired Ludlum Model 2241 meter and Model 44 -20 (3 inch by 3 inch) detector linked to a VIPER system will be mounted 6 inches from the ground surface on an AT V. The VIPER system and GIS will be used for geospatial information collection and analysis. Real -time in situ surface soil survey will consist of 5-foot wide transects covering 99 to 100 percent of the site at a pace of 3 feet per second. If an immovable obstruction is encountered during the survey it will not be moved, and the scanning survey will be performed around the feature.

If gamma radiation measurements along the perimeter of the site exceed the investigation level, lateral step -out delineation wi ll continue beyond the current site boundary until the recorded gamma radiation measurements are below the investigation level. Co -located static one -minute gamma radiation counts at surface soil sample locations will be used to establish the relationship between gamma radiation measurements (cpm) and Ra-226 concentration in soil.

6.4 SUBSURFACE GAMMA RADIATION SURVEY PROCEDURES

As describe above in Secti on 4.1.2, subsurface soil will be scan ned by advancing a borehole to a subsurface depth of approximately 10 feet bgs, after which a Ludlum 44 -62 (0.5 inch by 1 inch) detector paired with a Ludlum 2221 meter will be placed within a thin -walled PVC (or similar) pipe with lead -shielded base and lowered into the borehole to collect static gamma measurements at regular intervals.

Using Visual Sampling Plan (VSP) software, an estimated number of 105 soil borings were distributed across the site to evaluate the vertical extent of contamination. An estimated 75 borings are located within the AUM bo undaries, and an estimated 30 borings are located with in the offsite delineation areas.

If START is able to procure an automated down -hole gamma logger (2MGA -1000 or similar), the equipment will be test in addition to the method described above, and result s will be compared accordingly.

6.5 SOIL SAMPLING PROCEDURES

Soil samples will be collected from the AUM gamma radiation survey unit from surface locations (0 to 6 inches bgs) and subsurface locations (0 to 10 feet bgs).

6.5.1 Surface Soil

In addition to the four background surface soil samples detailed in Section 4.1.2, up to 15 surface soil samples will be collected at the site. Surface soil samples will be co-located with one-minute static gamma radiation counts to establish a relationship between Ra-226 concentrations and gamma radiation measurements (cpm) in soil. Surface soil samples will be collected using a disposable trowel and placed into a dedicated 8-ounce plastic sample jar or plastic sealable bag. If present, non-soil material including rocks larger than approximately ½-inch median diameter will be removed from the soil sample. Sample jars will be stored in a cooler according to the laboratory requirements in Table 5-1. Samples will be shipped to the laboratory for Ra-226 analysis using the EML HASL 300 4.5.2.3 method at the end of field activities. Sampling equipment will be decontaminated after every sample according to Section 6.6.

Surface soil samples will be collected from 0 to 6 inches bgs from locations where gamma radiation measurements are above the investigation level according to the following ranges:

- Investigation level plus 10,000 cpm
- Investigation level plus 20,000 cpm
- Investigation level plus 30,000 cpm
- Investigation level plus 50,000 cpm

Surface soil samples will be collected from locations within the ranges of interest in each soil type and vegetation cover observed at the site. All sample information will be logged in the electronic data collection device, photographed, and marked with a GPS.

Two duplicate samples (or 10% of total samples) will be collected and given false sample IDs for the purposed of QA/QC. Additional surface soil samples may be collected based on field observations.

All sample locations will be recorded in an electronic data collection device as sampling is completed. Each field sampling team will document each individual sampling location in the device, which includes: the site name, where the sample was collected with a representative sketch of the area, GPS coordinates of the sample location, date, time, sample identification (ID), sampling team members, and photographs taken.

6.5.2 Subsurface Soil

In addition to the two background subsurface soil samples detailed in Section 4.1.2, up to 10 subsurface soil samples will be collected at site and analyzed for Ra-226 by EML HASL 300 4.5.2.3 method. Subsurface sample locations will be co-located with 10 surface sample locations.

Subsurface soil samples will be collected using an EPA-supplied direct-push drill rig, with disposable acetate liner to collect soil cores. The boreholes will be advanced to a depth of 10 feet bgs, and the disposal sleeves will be placed on a plastic-sheet lined table and labeled. Following the removal of the soil core, a Ludlum 44-62 detector (0.5 inch by 1 inch) paired with a Ludlum 2221 meter will be placed in a thin -walled PVC (or similar) pipe with a lead -shielded base and lowered into the borehole to collect static gamma measurements at regular intervals. Based on the gamma scanning, the soil sample depth will be determined, and the sample will be collected directly from the core.

All sample and geological lithography information will be logged in the electronic data collection device, photographed, and marked with a GPS. Sampling equipment will be decontaminated in accordance with SOP #2006.

Two duplicate samples (or 10% of total samples) will be collected and given false sample IDs for the purposed of QA/QC. Additional surface soil samples may be collected based on field observations.

6.6 FIELD DECONTAMINATION PROCEDURES

Decontamination activities will be conducted by the START in accordance with Environmental Response Team SOP #2006. All non-dedicated sample handling devices will be decontaminated according to the following procedure:

- Non-phosphate detergent and tap water wash using a brush to scrub solids from the surface
- Tap water rinse
- Triple deionized/distilled water rinse

7. DISPOSAL OF INVESTIGATION-DERIVED WASTE

In the process of collecting environmental samples at this site, several different types of potentially contaminated investigation-derived wastes (IDW) will be generated, including the following:

- Used personal protective equipment (PPE)
- Disposable sampling equipment
- Decontamination fluids

- The EPA's National Contingency Plan required that management of IDW generated during site investigations comply with all relevant or appropriate requirements to the extent practicable. This sampling plan will follow the U.S. EPA Office of Emergency and Remedial Response Management of Investigation-Derived Wastes during Site Inspections (Directive 9345.3-02), May 1991 (EPA 1991), which provides the guidance for management of IDW during site investigations. Listed below are the procedures that will be followed for handling IDW. The procedures are flexible enough to allow the site investigation team to use its professional judgment on the proper method for the disposal of each type of IDW generated at each sampling location.

- Used PPE and disposable sampling equipment will be double bagged in plastic trash bags and disposed of in a municipal refuse dumpster. These wastes are not considered hazardous and can be sent to a municipal landfill. Any PPE or dedicated equipment that is to be disposed of that can still be reused will be rendered inoperable before disposal.
- Decontamination fluids will consist of water with residual contaminants and/or non-phosphate detergent. These fluids will be left onsite to evaporate.

8. SAMPLE IDENTIFICATION, DOCUMENTATION AND SHIPMENT

8.1 SAMPLE NOMENCLATURE

For survey location data using the VIPER system each measurement will have a unique geospatial coordinate.

A unique, identifiable name will be assigned to each soil sample. Soil samples will be identified according to the following nomenclature:

[Sample Description]-[Sample Number]-[Sample Depth]
Where:
Sample Description – "SS" will designate soil and "BG" will designate background
Sample Number – Number representing the specific sampling location where the sample was collected starting with 01.
Sample Depth – Sample depth will be identified with a letter indicating the sample depth sequence, where "A" indicates a surface sample, and subsequent letter indicate subsequent depths

For example, the first background sample collected from surface soil (0 to 6 inches bgs) will be identified as follows: BG-01-A

Field duplicate samples will be given an false location identifier, therefore sample "SS -17-B" maybe a duplicate of sample "SS-011-B"

8.2 CONTAINER, PRESERVATION, AND HOLDING TIME REQUIREMENTS

All sample containers will have been delivered to the START in a pre-cleaned condition. Container, preservation, and holding time requirements are summarized in Table 5-1.

8.3 SAMPLE LABELING, PACKAGING, AND SHIPPING

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. Sample labels will be affixed to the sample containers and will contain the following information:

- Sample number
- Date and time of collection
- Site name
- Analytical parameter and method of preservation

- Samples will be stored in a secure location onsite pending onsite analysis and shipment to the laboratory. Sample coolers will be retained in the custody of site personnel at all times or secured so as to deny access to anyone else.

- The procedures for shipping soil samples are:
- If ice is used then it will be packed in double ziplock plastic bags.

- The drain plug of the cooler will be sealed with tape to prevent melting ice from leaking.
- The bottom of the cooler will be lined with bubble wrap to prevent breakage during shipment.
- Screw caps will be checked for tightness.
- Containers will have custody seals affixed so as to prevent opening of the container without breaking the seal.
- All glass sample containers will be wrapped in bubble wrap.
- All containers will be sealed in plastic bags.

- All samples will be placed in coolers with the appropriate chain-of-custody forms. All forms will be enclosed in plastic bags and affixed to the underside of the cooler lid. If samples require refrigeration during shipment then bags of ice will be placed on top of and around samples. Empty space in the cooler will be filled with bubble wrap or Styrofoam peanuts to prevent movement and breakage during shipment. Each ice chest will be securely taped shut with strapping tape, and custody seals will be affixed to the front, right, and back of each cooler.
- Samples will be shipped for immediate delivery to the laboratory. Upon shipping, the laboratory will be notified of:
    - Sampling contractor's name.
    - The name of the site.
    - Shipment date and expected delivery date.
    - Total number of samples, by matrix and the relative level of contamination for each sample (i.e., low, medium, or high).
    - Carrier; air bill number(s), method of shipment (e.g., priority).
    - Irregularities or anticipated problems associated with the samples.
    - Whether additional samples will be sent; whether this is the last shipment.

8.4 CHAIN-OF-CUSTODY FORMS AND QA/QC SUMMARY FORMS

- A chain-of-custody form will be maintained for all samples to be submitted for analysis, from the time the sample is collected until its final deposition. Every transfer of custody must be noted and a signature affixed. Corrections on sample paperwork will be made by drawing a single line through the mistake and initialing and dating the change. The correct information will be entered above, below, or after the mistake. When samples are not under the direct control of the individual responsible for them, they must be stored in a locked container sealed with a custody seal. The chain-of-custody form must include the following:

- Sample identification numbers
- Identification of sample to be used for Matrix Spike/Matrix Spike Duplicate (MS/MSD) purposes
- Site name
- Sample date
- Number and volume of sample containers
- Required analyses
- Signature and name of samplers

- Signature(s) of any individual(s) with control over samples
- Airbill number
- Note(s) indicating special holding times and/or detection limits

The chain-of-custody form will be completed and sent with the samples for each laboratory and each shipment. Each sample cooler should contain a chain-of-custody form for all samples within the sample cooler.

A sample summary form will be completed for each method and each matrix of the sampling event. The sample number for all blanks, reference samples, laboratory QC samples (MS/MSDs), and duplicates will be documented on this form. This form is not sent to the laboratory. The original form will be sent to the reviewer who is validating and evaluating the data; a photocopy of the original will be made for the PM master file.

9. QUALITY ASSURANCE AND CONTROL (QA/QC)

9.1 QUALITY CONTROL/QUALITY ASSURANCE SAMPLES

QA/QC samples to be collected during this sampling are listed in Table 5 -1 and described in the following subsections. QA/QC described in the following sections pertains to samples collected for laboratory analysis to obtain definitive data and do not pertain to field measurements. QA/QC relevant to field measurement data is discussed in section 5.1.

9.1.1 Equipment Blank Samples

For n on-dedicated equipment such as stainless steel direct-push rods , to collect samples, equipment rinsate blanks will be collected at a rate of one per day to evaluate field decontamination procedures. Equipment rinsate blank consists of a sample of analyte -free water passed through or over a decontaminated sampling device into a 500 milliliter plastic bottle.

9.1.2 Assessment of Sample Variability

Duplicate soil samples will be collected at selected sample locations. These locations will be chosen randomly in the field and will be collected at a rate of 1 for every 10 field samples. The duplicate sample will be obtained by splitting the homogenized sample collected from the soil location. The duplicate sample will be placed in a 8-ounce plastic jar and labeled accordingly.

9.1.3 Laboratory Quality Control Samples

Analyses for radioisotopes do not typical ly have MS/MSD requirements; therefore, none will be performed.

9.1.4 Conformation Samples

The samples submitted to the laboratory for definitive analysis will be used to establish and/or document the comparability and correlation between field screening and lab oratory data. START will determine correlation of the data sets by linear regression analysis and will determine relative percent differences for each data pair and for the data sets as a whole. Confirmation samples will determine the usefulness of the fie ld screening technique in future activities at the site.

9.2 ANALYTICAL AND DATA PACKAGE REQUIREMENTS

It is required that all samples be analyzed according to the methods listed in Table 5 -1. The laboratory is required to supply documentation to demonstrate th at their data meet the requirements specified in the method. Since the Ra -226 determination requires a 21 -day ingrowth period prior to analysis, the preliminary results will be delivered to START within 4 weeks of sample delivery. A complete analytical dat a package will be required from the analytical laboratory 30 working days after sample delivery. The laboratory will also provide all data electronically in a Microsoft Excel -compatible format or delimited text file in the format specified for SCRIBE. The data validator will provide a full validation data package to the

START PM within 15 days after receipt of complete analytical data package from the laboratory.

All field measurements and QA/QC information will be documented in log books, field forms, and spreadsheets or may be directly downloaded into a database.

- Deliverables for this project must meet the guidelines in EPA Region IX's Laboratory Documentation Requirements for Data Evaluation, R9/QA/00.4.1 (EPA 2001). The following data requirements speci fy and emphasize general documentation requirements and are not intended to supersede or change requirements of each method.

- A copy of the chain-of-custody, sample log-in records, and a case narrative describing the analyses and methods used.
- Analytical data (results) for up to three significant figures for all samples, method blanks, MS/MSD, Laboratory Control Samples (LCS), duplicates, Performance Evaluation (PE) samples, and field QC samples.
- QC summary sheets/forms that summarize the following:
- MS/MSD/LCS recovery summary
- Method/preparation blank summary
- Initial and continuing calibration summary (including retention time windows)
- Sample holding time and analytical sequence (i.e., extraction and analysis)
- Calibration curves and correlation coefficients
- Duplicate summary
- Detection limit information
- Analyst bench records describing dilution, sample weight, percent moisture (solids), sample size, sample extraction and cleanup, final extract volumes, and amount injected.
- Standard preparation logs, including certificates of analysis for stock standards.
- Detailed explanation of the quantitation and identification procedure used for specific analyses, giving examples of calculations from the raw data.
- The final deliverable report will consist of sequentially numbered pages.

9.3 DATA MANAGEMENT

Data collected during the removal assessment will consist of field and laboratory data. Field activities and sample information will be documented in a logbook as discussed in Section 6.1.4. Field and laboratory data including gamma radiation measurements, Ra -226 sample results, and location coordinates, will be loaded in SCRIBE. All data including logbook, complete analytical and validation data packages, photographs, and electronic data will be archived by START. The laboratory data summary and validation reports will be included in the final report submitted to EPA. The DMP is included as Appendix D.

9.4 DATA VALIDATION

Data validation will be performed by START or their subcontractor according to the EPA Region IX Superfund Data Evaluation/Validation Guidance R9QA/006.1 (EPA 2001). The standard data quality review requirements of a Tier 2 validation of 100 percent of the data (as defined in Requirements for Quality Assurance Project Plans [EPA 2001]) will satisfy the data quality requirements for this portion of the project. An additional 25 percent of sample results will be sent to a third party data validator. Upon completion of validation, data will be classified as one of the following: acceptable for use without qualificatio ns, acceptable for use with qualifications, or unacceptable for use. A START certified health physicist will review all data and validation reports.

If during or after the evaluation of the project's analytical data it is found that the data contain excess QA/QC problems or if the data do not meet the DQI goals, then the independent reviewer may determine that additional data evaluation is necessary. Additional evaluation may include EPA Region IX Superfund Data Evaluation/Validation Guidance R9QA/006.1 fo r evaluation Tier 3.

To meet evaluation and project requirements, the following criteria will be evaluated during a Tier 2 evaluation:

- Data package completeness
- Laboratory QA/QC summaries
- Holding times
- Blank contamination
- Matrix related recoveries
- Field duplicates
- Random data checks
- Preservation and holding times
- Initial and continuing calibration
- Blank analyses
- Interference check samples
- Laboratory control samples
- Duplicate sample analysis
- Matrix spike sample analyses
- Sample serial dilution
- Field duplicate/replicate
- Overall assessment of data

Upon completion of evaluation, an analytical data evaluation Tier 2 review report will be delivered to the PM, and the data will be classified within the report as one of the following:

- Acceptable for use without qualifications
- Acceptable for use with qualifications
- Unacceptable for use

The data with applicable qualifications will be attached to the report. Unacceptable data may be more thoroughly examined to determine whether corrective action could mitigate data usability.

9.5 FIELD VARIANCES

As conditions in the field may vary, it may become necessary to implement minor modifications to this plan. When appropriate, the START QA Coordinator and the EPA FOSC will be notified of the modifications and a verbal approval obtained before implementing the modifications. Modifications to the original plan will be recorded in site records and documented in the final report.

9.6 ASSESSMENT OF PROJECT ACTIVITIES

9.6.1 Assessment Activities

The following assessment activities will be performed by the START:

- All project deliverables (SAP, Data Summaries, Data Validation Reports, Removal Assessment Report) will be peer-reviewed by START prior to submission to EPA. In time-critical situations, the peer review may be concurrent with the release of a draft document to EPA.
- The START QA Coordinator will review project documentation such as logbooks and chain-of-custody forms to ensure the SAP was followed and that sampling activities were adequately documented. The START QA Coordinator will document deficiencies, and the START PM will be responsible for corrective actions.

9.6.2 Project Status Reports to Management

It is standard procedure for the START PM to report to the EPA FOSC any issues, as they occur, that arise during the course of the project that could affect data quality, data use objectives, the project objectives, or project schedules. As requested by EPA, START will provide unvalidated data as they are received from the laboratory.

9.6.3 Reconciliation of Data with DQOs

Assessment of data quality is an ongoing activity throughout all phases of a project. The following outlines the methods to be used by the START for evaluating the results obtained from the project.

Review of the DQO outputs and the sampling design will be conducted by the START QA Coordinator prior to sampling activities. The reviewer will submit comments to the START PM for action, comment, or clarification. This process will be iterative.

A preliminary data review will be conducted by the START. The purpose of this review is to look for problems or anomalies in the implementation of the sample collection and analysis procedures and to examine QC data for information to verify assumptions underlying the DQOs and the SAP. When appropriate to sample design, basic statistical quantities will be calculated and the data will be graphically represented. When appropriate to the sample design and if specifically tasked to do so by the U.S. EPA TM, the START will select a statistical hypothesis test and identify assumptions underlying the test.

10. REFERENCES

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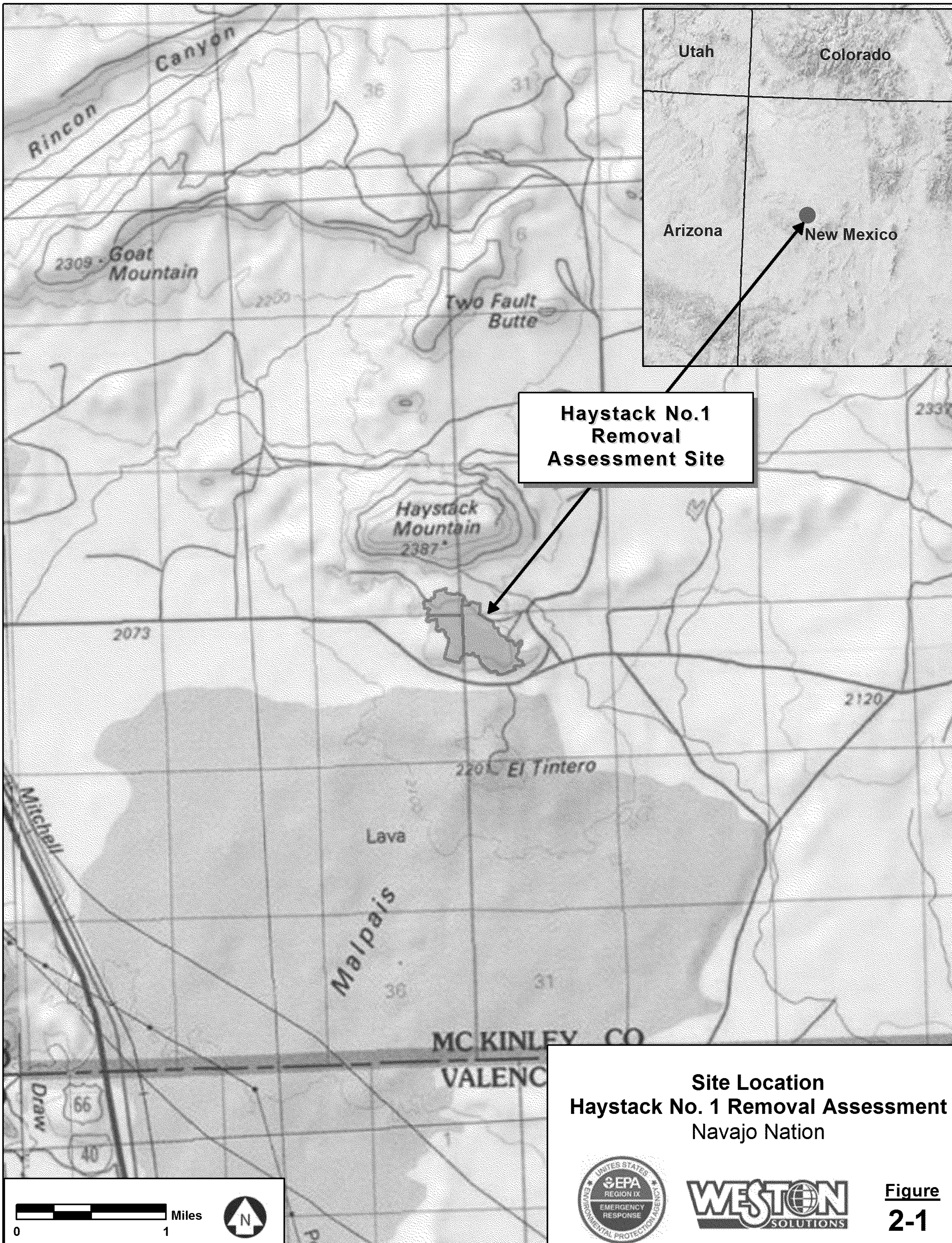
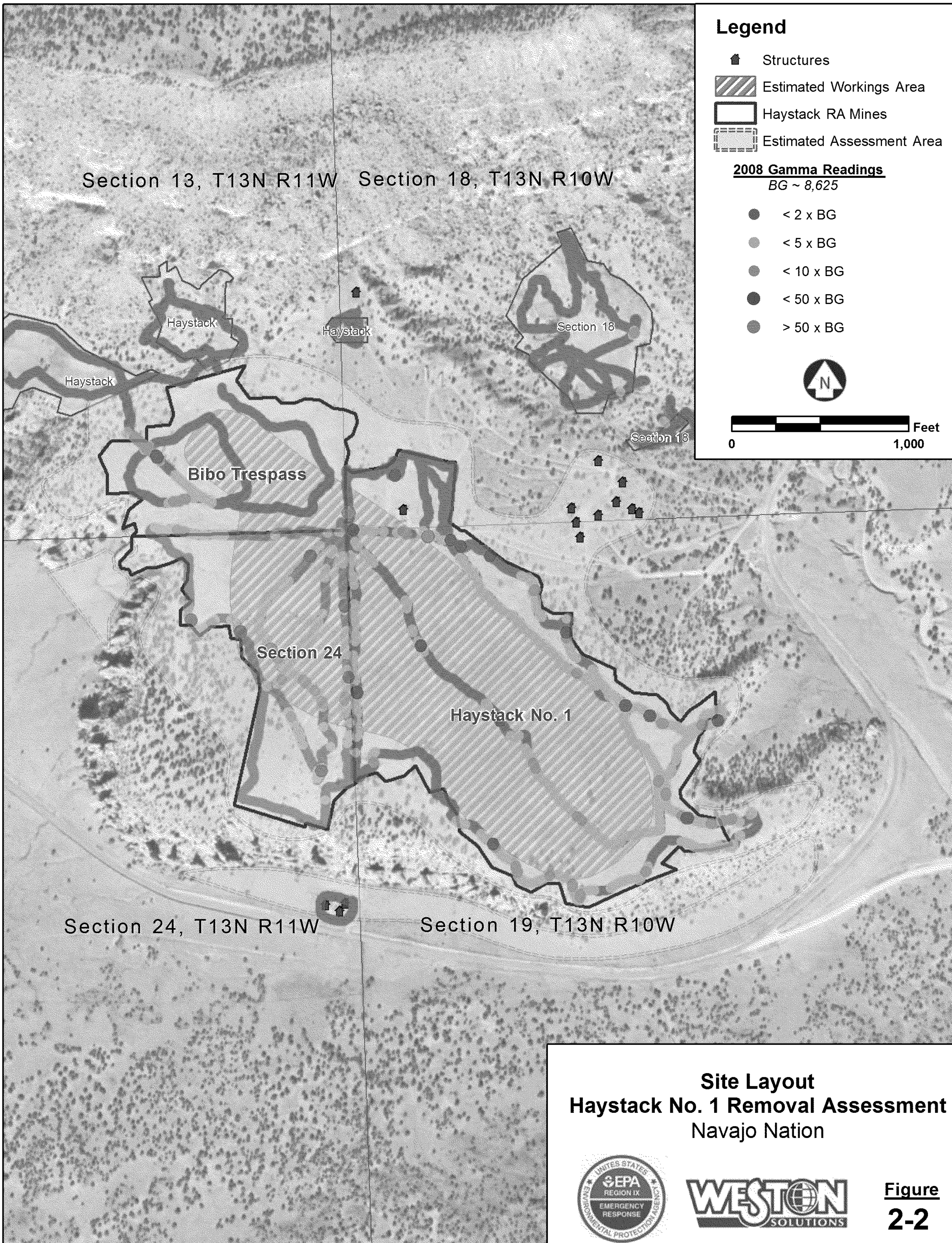
APPENDIX A
SITE MAPS

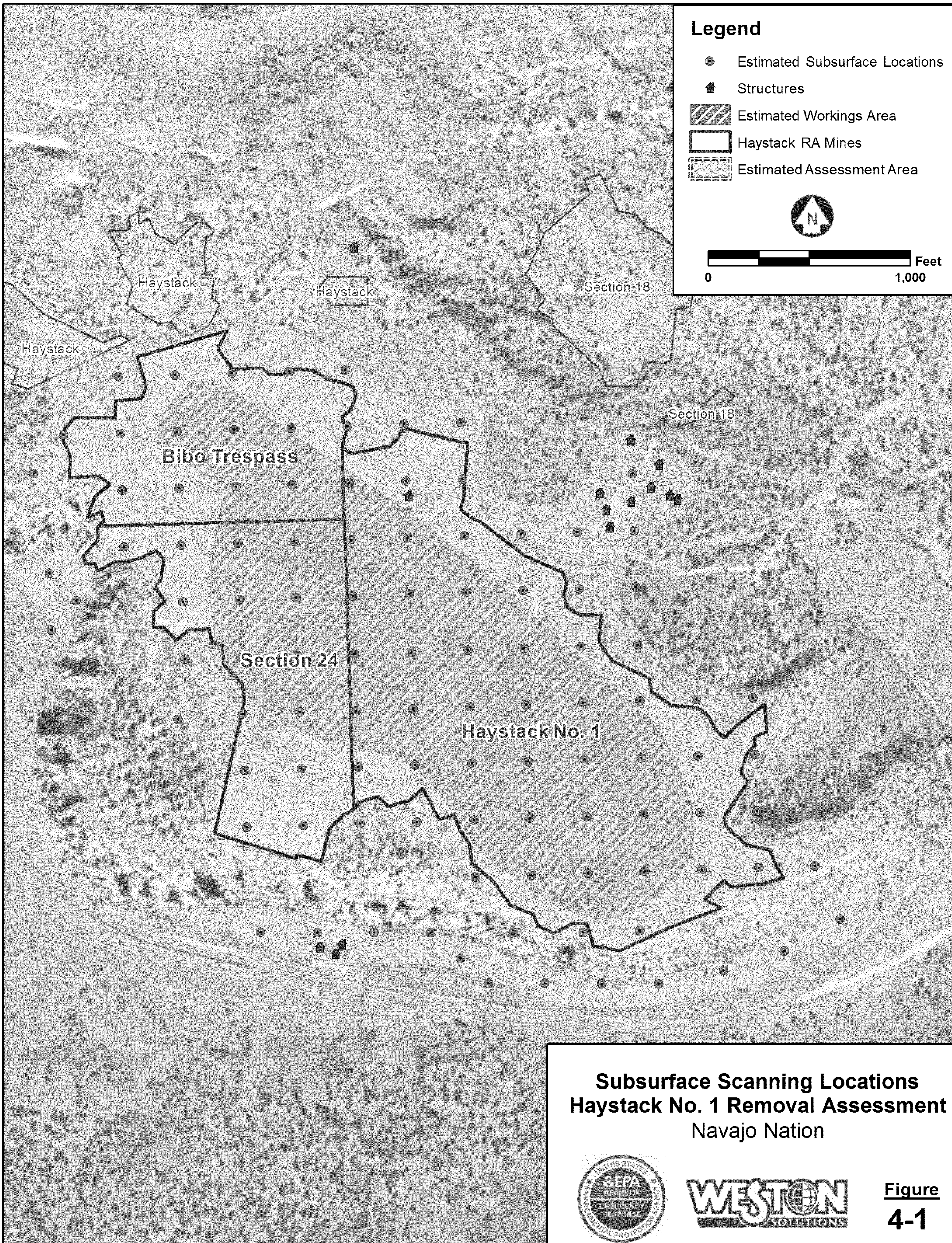


Site Location
Haystack No. 1 Removal Assessment
Navajo Nation

Figure 2-1



Legend
Structures
Estimated Workings Area
Haystack RA Mines
Estimated Assessment Area
2008 Gamma Readings
BG ~ 8,625
< 2 x BG
< 5 x BG
< 10 x BG
< 50 x BG
> 50 x BG
N
Feet
0
1,000
Section 13, T13N R11W
Section 18, T13N R10W
Haystack
Haystack
Haystack
Section 18
Section 18
Bibo Trespass
Section 24
Haystack No. 1
Section 24, T13N R11W
Section 19, T13N R10W
Site Layout
Haystack No. 1 Removal Assessment
Navajo Nation
Figure
2-2



Subsurface Scanning Locations
Haystack No. 1 Removal Assessment
Navajo Nation

Figure
4-1

APPENDIX B
STANDARD OPERATING PROCEDURES (SOPS)

MODEL 5400 GEOPROBE™ OPERATION

SOP#: 2050
DATE: 03/27/96
REV. #: 0.0

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to describe the collection of representative soil, soil-gas, and groundwater samples using a Model 5400 Geoprobe™ sampling device. Any deviations from these procedures should be documented in the site/field logbook and stated in project deliverables.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (U.S. EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

The Geoprobe™ sampling device is used to collect soil, soil-gas and groundwater samples at specific depths below ground surface (BGS). The Geoprobe™ is hydraulically powered and is mounted in a customized four-wheel drive vehicle. The base of the sampling device is positioned on the ground over the sampling location and the vehicle is hydraulically raised on the base. As the weight of the vehicle is transferred to the probe, the probe is pushed into the ground. A built-in hammer mechanism allows the probe to be driven through dense materials. Maximum depth penetration under favorable circumstances is about 50 feet. Components of the Model 5400 Geoprobe™ are shown in Figures 1 through 6 (Appendix A).

Soil samples are collected with a specially-designed sample tube. The sample tube is pushed and/or vibrated to a specified depth (approximately one foot above the intended sample interval). The interior plug of the sample tube is removed by inserting small-diameter threaded rods. The sample tube is then driven an additional foot to collect the samples. The probe sections and sample tube are then withdrawn and the sample is extruded from the tube into sample jars.

Soil gas can be collected in two ways. One method involves withdrawing a sample directly from the probe rods, after evacuating a sufficient volume of air from the probe rods. The other method involves collecting a sample through tubing attached by an adaptor to the bottom probe section. Correctly used, the latter method provides more reliable results.

Slotted lengths of probe can be used to collect groundwater samples if the probe rods can be driven to the water table. Groundwater samples are collected using either a peristaltic pump or a small bailer.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING AND STORAGE

Refer to specific ERT SOPs for procedures appropriate to the matrix, parameters and sampling objector.

Applicable ERT SOPs include:

ERT #2012, Soil Sampling

ERT #2007, Groundwater Well Sampling

ERT #2042, Soil Gas Sampling

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

A preliminary site survey should identify areas to be avoided with the truck. All underground utilities should be located and avoided during sampling. Begin sampling activities with an adequate fuel supply.

Decontamination of sampling tubes, probe rods, adaptors, non-expendable points and other equipment that contacts the soil is necessary to prevent cross-contamination of samples. During sampling, the bottom portion and outside of the sampling tubes can be contaminated with soil from other depth intervals.

Care must be taken to prevent soil which does not represent the sampled interval form being incorporated into the sample. Excess soil should be carefully wiped from the outside surface of the sampling tube and the bottom 3 inches of the sample should be discarded before extruding the sample into a sample jar.

The amount of sample to be collected and the proper sample container type (i.e., glass, plastic), chemical preservation, and storage requirements are dependent upon the parameter(s) of interest. Guidelines for the containment, preservation, handling and storage of soil-gas samples are described in ERT SOP #2042, Soil-Gas Sampling.

Obtaining sufficient volume of soil for multiple analyses from one sample location may present a problem. The Geoprobe™ soil sampling system recovers a limited volume of soil and it is not possible to reenter the same hole and collect additional soil. When multiple analyses are to be performed on soil samples collected with the Geoprobe™, it is important that the relative importance of the analyses be identified. Identifying the order of importance will ensure that the limited sample volume will be used for the most crucial analyses.

5.0 EQUIPMENT/APPARATUS

Sampling with the Geoprobe™ involves use of the equipment listed below. Some of the equipment is used for all sample types, others are specific to soil (S), soil gas (SG), or groundwater (GW) as noted.

- Geoprobe™ sampling device
- Threaded probe rods (36", 24", and 12" lengths)
- Drive Caps
- Pull Caps
- Rod Extractor
- Expendable Point Holders
- Expendable Drive Points
- Solid Drive Points
- Extension Rods
- Extension Rod Couplers
- Extension Rod Handle
- Hammer Anvil
- Hammer Latch
- Hammer Latch Tool
- Drill Steels
- Carbide-Tipped Drill Bit
- Mill-Slotted Well Point (GW)
- Threaded Drive Point (GW)
- Well Mini-Bailer (GW)
- Tubing Bottom Check Valve (GW)
- 3/8" O.D. Low Density Polyethylene Tubing (GW, SG)
- Gas Sampling Adaptor and Cap (SG)
- Teflon Tape
- Neoprene "O" - Rings (SG)
- Vacuum System (mounted in vehicle) (SG)
- Piston Tip (S)
- Piston Rod (S)
- Piston Stop (S)
- Sample Tube (11.5" in length) (S)
- Vinyl Ends Caps (S)
- Sample Extruder (S)
- Extruder Pistons (Wooden Dowels) (S)
- Wire Brush
- Brush Adapters
- Cleaning Brush (Bottle)

6.0 REAGENTS

Decontamination solutions are specified in ERT SOP #2006, Sampling Equipment Decontamination.

7.0 PROCEDURES

Portions of the following sections have been condensed from the Model 5400 Geoprobe™ Operations Manual(1). Refer to this manual for more detailed information concerning equipment specifications, general maintenance, tools, throttle control, clutch pump, GSK-58 Hammer, and trouble-shooting. A copy of this manual will be maintained with the Geoprobe™ and on file in the Quality Assurance (QA) office.

7.1 Preparation

1. Determine extent of the sampling effort, sample matrices to be collected, and types and amounts of equipment and supplies required to complete the sampling effort.

2. Obtain and organize necessary sampling and monitoring equipment.

3. Decontaminate or pre-clean equipment, and ensure that it is in working order.

4. Perform a general site survey prior to site

entry in accordance with the site-specific Health and Safety Plan.

5. Use stakes or flagging to identify and mark all sampling locations. All sample locations should be cleared for utilities prior to sampling.

7.2 Setup of Geoprobe™

1. Back carrier vehicle to probing location.

2. Shift the vehicle to park and shut off ignition.

3. Set parking brake and place chocks under rear tires.

4. Attach exhaust hoses so exhaust blows downwind of the sampling location (this is particularly important during soil gas sampling).

5. Start engine using the remote ignition at the Geoprobe™ operator position.

6. Activate hydraulic system by turning on the Electrical Control Switch located on the Geoprobe™ electrical control panel (Figure 1, Appendix A). When positioning the probe, always use the SLOW speed. The SLOW speed switch is located on the hydraulic control panel (Figure 2, Appendix A).

   Important: Check for clearance on vehicle roof before folding Geoprobe™ out of the carrier vehicle.

7. Laterally extend the Geoprobe™ from the vehicle as far as possible by pulling the EXTEND control lever toward the back of the vehicle while the Geoprobe™ is horizontal.

8. Using the FOOT control, lower the Derrick Slide so it is below cylinder (A) before folding the Geoprobe™ out of the carrier vehicle (Figure 3, Appendix A). This will ensure clearance at the roof of the vehicle.

9. Use the FOLD, FOOT, and EXTEND controls to place Geoprobe™ to the exact probing location. Never begin probing in the fully extended position.

10. Using the FOLD control, adjust the long axis of the probe cylinder so that it is perpendicular (visually) to the ground surface.

11. Using the FOOT control, put the weight of the vehicle on the probe unit. Do not raise the rear of the vehicle more than six inches.

    Important: Keep rear vehicle wheels on the ground surface when transferring the weight of the vehicle to the probe unit. Otherwise, vehicle may shift when probing begins.

12. When the probe axis is vertical and the weight of the vehicle is on the probe unit, probing is ready to begin.

7.3 Drilling Through Surface Pavement or Concrete

1. Position carrier vehicle to drilling location.

2. Fold unit out of carrier vehicle.

3. Deactivate hydraulics.

4. Insert carbide-tipped drill bit into hammer.

5. Activate HAMMER ROTATION control by turning knob counter-clockwise (Figure 4, Appendix A). This allows the drill bit to rotate when the HAMMER control is pressed.

6. Press down on HAMMER control to activate counterclockwise rotation.

7. Both the HAMMER control and the PROBE control must be used when drilling through the surface (Figure 4, Appendix A). Fully depress the HAMMER control, and incrementally lower the bit gradually into the pavement by periodically depressing the PROBE control.

8. When the surface has been penetrated, turn the HAMMER Control Valve knob

clockwise to deactivate hammer rotation and remove the drill bit from the HAMMER.

Important: Be sure to deactivate the rotary action before driving probe rods.

7.4 Probing

1. Position the carrier vehicle to the desired sampling location and set the vehicle parking brake.

2. Deploy Geoprobe™ Sampling Device.

3. Make sure the hydraulic system is turned off.

4. Lift up latch and insert hammer anvil into hammer - push latch back in (Figure 5, Appendix A).

5. Thread the drive cap onto the male end of the probe rod.

6. Thread an expendable point holder onto the other end of the first probe rod.

7. Slip an expendable drive point into point holder.

8. Position the leading probe rod with expendable drive point in the center of the derrick foot and directly below the hammer anvil.

   Important: Positioning the first probe rod is critical in order to drive the probe rod vertically. Therefore, both the probe rod and the probe cylinder shaft must be in the vertical position (Figure 6, Appendix A).

9. To begin probing, activate the hydraulics and push the PROBE Control downward. When advancing the first probe rod, always use the SLOW speed. Many times the probe rods can be advanced using only the weight of the carrier vehicle. When this is the case, only the PROBE control is used.

   Important: When advancing rods, always keep the probe rods parallel to the probe cylinder shaft (Figure 6, Appendix A). This is done by making minor adjustments with the FOLD control. Failure to keep probe rods parallel to probe cylinder shaft may result in broken rods and increased difficulty in achieving desired sampling depth.

7.5 Probing - Percussion Hammer

The percussion hammer must be used in situations where the weight of the vehicle is not sufficient to advance the probe rods.

1. Make sure the Hammer Rotation Valve is closed.

2. Using the PROBE control to advance the rod, press down the HAMMER control to allow percussion to drive the rods (Figure 2, Appendix A).

   Important: Always keep static weight on the probe rod or the rod will vibrate and chatter while you are hammering, causing rod threads to fracture and break.

3. Keep the hammer tight to the drive cap so the rod will not vibrate.

4. Periodically stop hammering and check if the probe rods can be advanced by pushing only.

5. Any time the downward progress of the probe rods is refused, the derrick foot may lift off of the ground surface. When this happens, reduce pressure on the PROBE control. Do not allow the foot to rise more than six inches off the ground or the vehicle's wheels may lift off the ground surface, causing the vehicle to shift (Figure 6, Appendix A).

6. As the derrick foot is raised off the ground surface, the probe cylinder may not be in a perpendicular position. If this happens, use the FOLD control to correct the probe cylinder position.

7.6 Probing - Adding Rods

1. Standard probe rods are three feet in length. If the desired depth is more than three feet,

another rod must be threaded onto the rod that has been driven into the ground. In order to ensure a vacuum-tight seal (soil-gas sampling), two wraps of teflon tape around the thread is recommended.

2. Using the PROBE control, raise the probe cylinder as high as possible.

Important: Always deactivate hydraulics when adding rods.

3. Deactivate hydraulics.

4. Unthread the drive cap from the probe rod that is in the ground.

5. Wrap teflon tape around the threads.

6. Thread the drive cap onto the male end of the next probe rod to be used.

7. After threading the drive cap onto the rod to be added, thread the rod onto the probe rod that has been driven into the ground. Make sure threads have been teflon taped. Continue probing.

8. Continue these steps until the desired sampling depth has been reached.

7.7 Probing/Pulling Rods

1. Once the probe rods have been driven to depth, they can also be pulled using the Geoprobe™ Machine.

2. Turn off the hydraulics.

3. Lift up latch and take the hammer anvil out of the hammer.

4. Replace the drive cap from the last probe rod driven with a pull cap.

5. Lift up the hammer latch.

6. Activate the hydraulics.

7. Hold down on the PROBE control, and move the probe cylinder down until the latch can be closed over the pull cap.

Important: If the latch will not close over the pull cap, adjust the derrick assembly by using the extend control. This will allow you to center the pull cap directly below the hammer latch.

8. Retract the probe rods by pulling up on the PROBE control.

Important: Do not raise the probe cylinder all the way when pulling probe rods or it will be impossible to detach a rod that has been pulled out. However, it is necessary to raise the probe cylinder far enough to allow the next probe section to be pulled.

9. After retracting the first probe rod, lower the probe cylinder only slightly to ease the pressure off of the hammer latch.

10. Attach a clamping device to the base of the rods where it meets the ground to prevent rods from falling back into the hole.

11. Raise the hammer latch.

12. Hold the PROBE control up and raise the probe cylinder as high as possible.

13. Unthread the pull cap from the retracted rod.

14. Unthread the retracted rod.

15. Thread the pull cap onto the next rod that is to be pulled.

16. Continue these steps until all the rods are retracted from the hole.

17. Decontaminate all portions of the equipment that have been in contact with the soil, soil gas and groundwater.

7.8 Soil-Gas Sampling Without Interior Tubing

1. Follow procedures outlined in Sections 7.1 through 7.6.

2. Remove hammer anvil from hammer.

3. Thread on pull cap to end of probe rod.

4. Retract rod approximately six inches. Retraction of the rod disengages expendable drive point and allows for soil vapor to enter rod.

5. Unthread pull cap and replace it with a gas sampling cap. Cap is furnished with barbed hose connector.

   Important: Shut engine off before taking sample (exhaust fumes can cause faulty sample data).

6. Turn vacuum pump on and allow vacuum to build in tank.

7. Open line control valve. For each rod used, purge 300 liters of volume. Example: Three rods used = 900 liters = .900 on gauge.

8. After achieving sufficient purge volume, close valve and allow sample line pressure gauge to return to zero. This returns sample train to atmospheric pressure.

9. The vapor sample can now be taken.

   1. Pinch hose near gas sampling cap to prevent any outside vapors from entering the rods.

   2. Insert syringe needle into center of barbed hose connector and withdraw vapor sample.

10. To maintain suction at the sampling location, periodically drain the vacuum tank.

11. To remove rods, follow procedures outlined in Section 7.7.

7.9 Soil-Gas Sampling With Post-Run Tubing (PRT)

1. Follow procedures outlined in Sections 7.1 through 7.6.

2. Retract rod approximately six inches. Retraction of rod disengages expendable drive point and allows for soil vapor to enter rod.

3. Remove pull cap from the end of the probe rod.

4. Position the Geoprobe™ to allow room to work.

5. Secure PRT Tubing Adapter with "O" - Ring to selected tubing.

6. Insert the adapter end of the tubing down the inside diameter of the probe rods.

7. Feed the tubing down the hole until it hits bottom on the expendable point holder. Cut the tubing approximately two feet from the top probe rod.

8. Grasp excess tubing and apply some downward pressure while turning it in a counter-clockwise motion to engage the adapter threads with the expendable point holder.

9. Pull up lightly on the tubing to test engagement of threads.

10. Connect the outer end of the tubing to silicon tubing and vacuum hose (or other sampling apparatus).

11. Follow the appropriate sampling procedure (ERT SOP #2042, Soil Gas Sampling) to collect a soil-gas sample.

12. After collecting a sample, disconnect the tubing from the vacuum hose or sampling system.

13. Pull up firmly on the tubing until it releases from the adapter at the bottom of the hole.

14. Extract the probe rods from the ground and recover the expendable point holder with the attached adapter.

15. Inspect the "O"-ring at the base of the adapter to verify that proper sealing was achieved during sampling. The "O"-ring should be compressed.

    Note: If the "O"-ring is not compressed, vapors from within the probe sections may have been collected rather than vapors from the intended sample interval.

7.10 Soil Sampling

1. Follow procedures outlined in Sections 7.1 through 7.6.

2. Assemble soil-sampling tube.

    1. Thread piston rod into piston tip.

    2. Insert piston tip into sample tube, seating piston tip into cutting edge of sample tube.
    3. Thread drive head into threaded end of sample tube.

    4. Thread piston stop pin into drive head. Stop pin should be tightened with wrench so that it exerts pressure against the piston rod.

3. Attach assembled sampler onto leading probe rod.

4. Drive the sampler with the attached probe rods to the top of the interval to be sampled.

5. Move probe unit back from the top of the probe rods to allow work room.

6. Remove drive cap and lower extension rods into inside diameter of probe rods using couplers to join rods together.

7. Attach extension rod handle to top extension rod.

8. Rotate extension rod handle clockwise until the leading extension rod is threaded into the piston stop in downhole.

9. Continue to rotate extension rod handle clockwise until reverse-threaded stop-pin has disengaged from the drive head.

10. Remove extension rods and attached stop-pin from the probe rods.

11. Replace drive cap onto top probe rod.

12. Mark the top probe rod with a marker or tape at the appropriate distance above the ground surface (dependent on sample tube length).

13. Drive probe rods and sampler the designated distance. Be careful not to overdrive the sampler which could compact the soil sample in the tube, making it difficult to extrude.

    Important: Documentation of sample location should include both surface and subsurface identifiers. Example: Correct Method - Sample Location S-6, 12.0' - 13.0'. Incorrect Method - Sample Location S-6, 12.0'.

14. Retract probe rods from the hole and recover the sample tube. Inspect the sample tube to confirm that a sample was recovered.

15. Disassemble sampler. Remove all parts.

16. Position extruder rack on the foot of the Geoprobe™ derrick.

17. Insert sample tube into extruder rack with the cutting end up.

18. Insert hammer anvil into hammer.

19. Position the extruder piston (wood dowel) and push sample out of the tube using the PROBE control on the Geoprobe™. Collect the sample as it is extruded in an appropriate sample container.

    Caution: use care when performing this task. Apply downward pressure gradually. Use of excessive force could result in injury to operator or damage to tools. Make sure proper diameter extruder piston is used.

20. To remove rods follow procedures outlined in Section 7.7.

7.11 Groundwater Sampling

1. Follow Sections 7.1 thorough 7.6 with the following exception: the Mill-Slotted Well Rod with attached threaded drive point should be the first section probed into the ground. Multiple sections of mill-slotted well rods can be used to provide a greater vertical section into which groundwater can flow.

2. Probe to a depth at which groundwater is expected.

3. Remove Drive Cap and insert an electric water-level indicator to determine if water has entered the slotted sections of probe rod. Refer to ERT SOP #2043, Water Level Measurement, to determine water level.

4. If water is not detected in the probe rods, replace the drive cap and continue probing. Stop after each additional probe length and determine if groundwater has entered the slotted rods.
5. After the probe rods have been driven into the saturated zone, sufficient time should be allowed for the water level in the probe rods to stabilize.

   Note: It will be difficult if not impossible to collect a groundwater sample in aquifer material small enough to pass through the slots (<0.02 inch diameter).

6. Groundwater samples may be collected with the 20-mL well Mini-Bailer or a pumping device. If samples are being collected for volatile organic analysis (VOA), the 20-mL Well Mini-Bailer should be used. If samples are being collected for a variety of analyses, VOA samples should be collected first using the bailer. Remaining samples can be collected by pumping water to the surface. Withdrawing water with the pump is more efficient than collecting water with the 20-mL well Mini-Bailer.

   Important: Documentation of sample location should include both surface and subsurface identifiers. Example: Sample Location GW-6, 17'-21' bgs, water level in probe rods is 17 feet bgs, and the leading section of probe rod is 21 feet bgs. The water sample is from this zone, not from 17 feet bgs or 21 feet bgs.

7. Remove rods following procedures outlined in Section 7.7.

8.0 CALCULATIONS

Calculating Vapor Purge Volume for Soil-Gas Sampling without Interior Tubing

Volume of Air to be Purged (Liters) = 300 x Number of Rods in the Ground

Volume in Liters/1000 = Reading on Vacuum Pump Instrument Gauge

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

The following general QA procedures apply:

1. All data must be documented on field data sheets or within site logbooks.

2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation and they must be documented.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA and the REAC site specific Health and Safety Plan. The following is a list of health and safety precautions which specifically apply to Geoprobe™ operation.

1. Always put vehicle in "park", set emergency the brake, and place chocks under the tires, before engaging remote ignition.

2. If vehicle is parked on a loose or soft surface, do not fully raise rear of vehicle with probe foot, as vehicle may fall or move.

3. Always extend the probe unit out from the vehicle and deploy the foot to clear vehicle roof line before folding the probe unit out.

4. Operators should wear OSHA approved steel-toed shoes and keep feet clear of probe foot.

5. Operator should wear ANSI approved hard hats.

6. Only one person should operate the probe machine and the assemble or disassemble probe rods and accessories.

7. Never place hands on top of a rod while it is under the machine.

8. Turn off the hydraulic system while changing rods, inserting the hammer anvil, or attaching accessories.

9. Operator must stand on the control side of the probe machine, clear of the probe foot and mast, while operating controls.

10. Wear safety glasses at all times during the operation of this machine.

11. Never continue to exert downward pressure on the probe rods when the probe foot has risen six inches off the ground.

12. Never exert enough downward pressure on a probe rod so as to lift the rear tires of the vehicle off the ground.

13. Always remove the hammer anvil or other tool from the machine before folding the machine to the horizontal position.

14. The vehicle catalytic converter is hot and may present a fire hazard when operating over dry grass or combustibles.

15. Geoprobe™ operators must wear ear protection. OSHA approved ear protection for sound levels exceeding 85 dba is recommended.

16. Locations of buried or underground utilities and services must be known before starting to drill or probe.

17. Shut down the hydraulic system and stop the vehicle engine before attempting to clean or service the equipment.

18. Exercise extreme caution when using extruder pistons (wooden dowels) to extrude soil from sample tubes. Soil in the sample tube may be compacted to the point that the extruder piston will break or shatter before it will push the sample out.

19. A dry chemical fire extinguisher (Type ABC) should be kept with the vehicle at <u>all</u> times.

12.0 REFERENCES

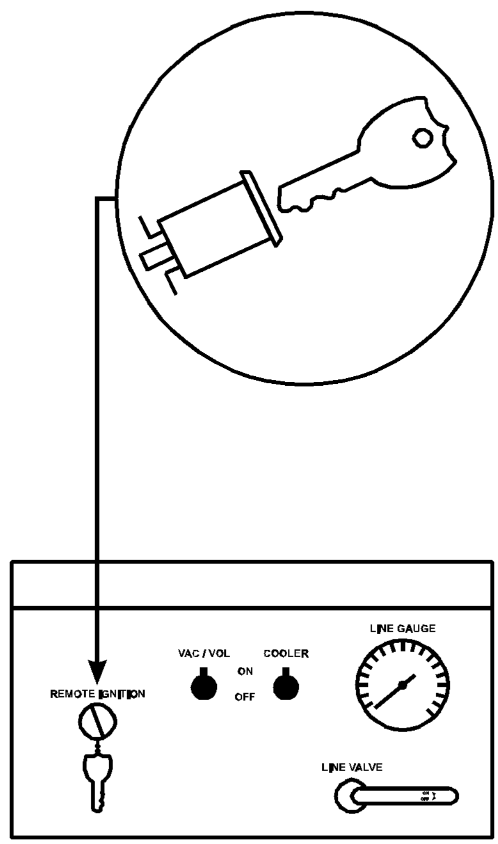
1. Model 5400 Geoprobe™ Operations Manual. Geoprobe™ Systems, Salina, Kansas. July 27, 1990.

2. Geoprobe™ Systems - 1995-96 Tools and Equipment Catalog.

APPENDIX A

Figures

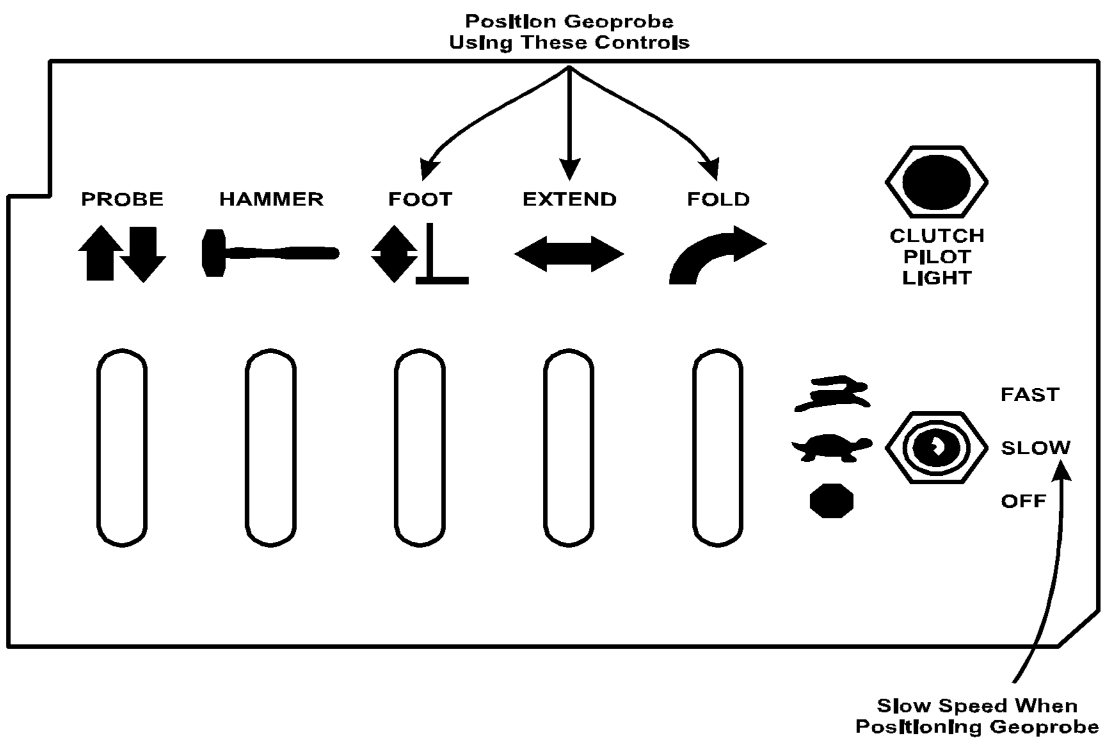
FIGURE 1. Electrical Control Panel



APPENDIX A (Cont'd)

Figures

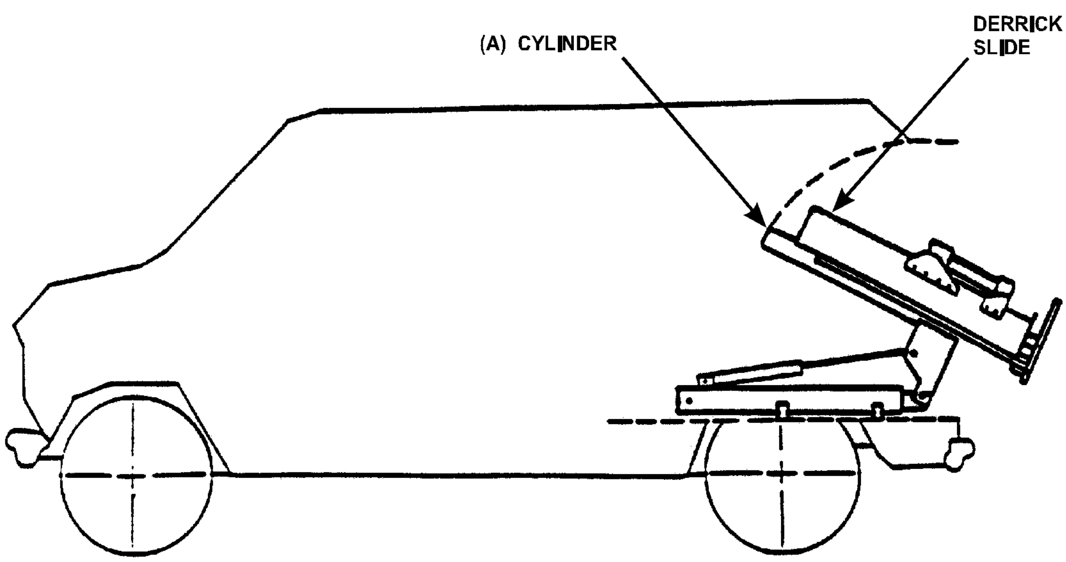
FIGURE 2. Hydraulic Control Panel



APPENDIX A (Cont'd)

Figures

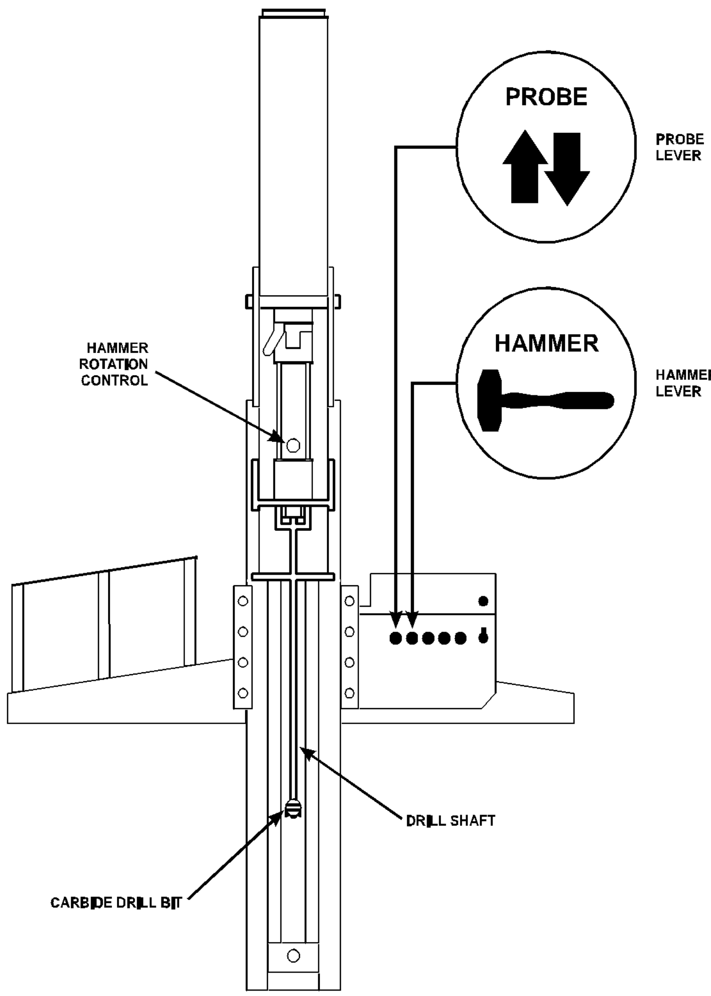
FIGURE 3. Deployment of Geoprobe™ from Sampling Vehicle



APPENDIX A (Cont'd)

Figures

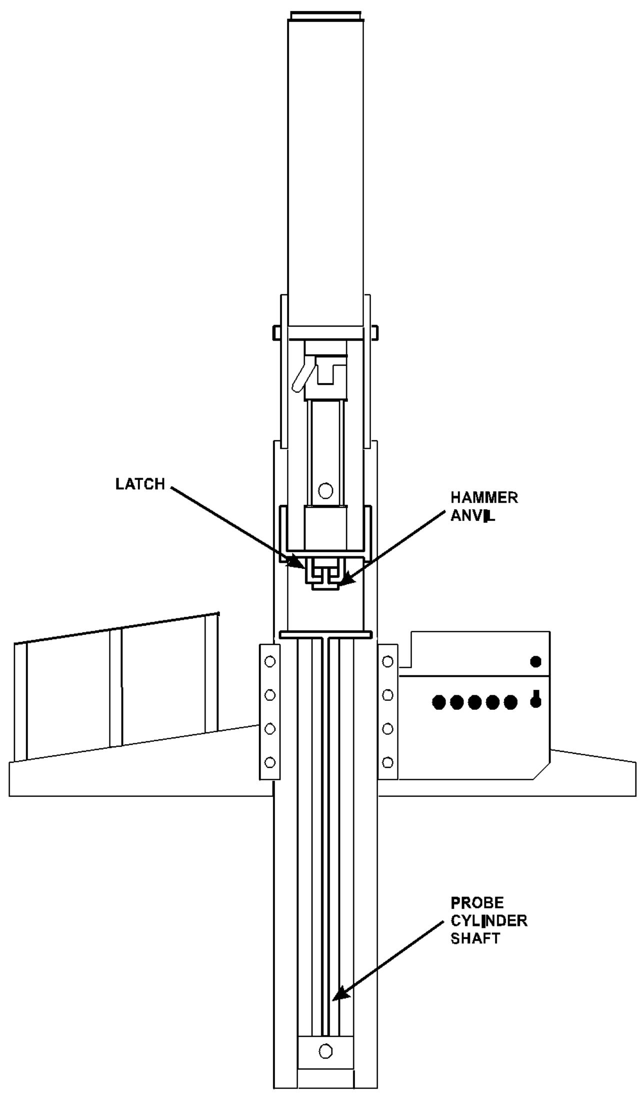
FIGURE 4. Geoprobe™ Setup for Drilling Through Concrete and Pavement



APPENDIX A (Cont'd)

Figures

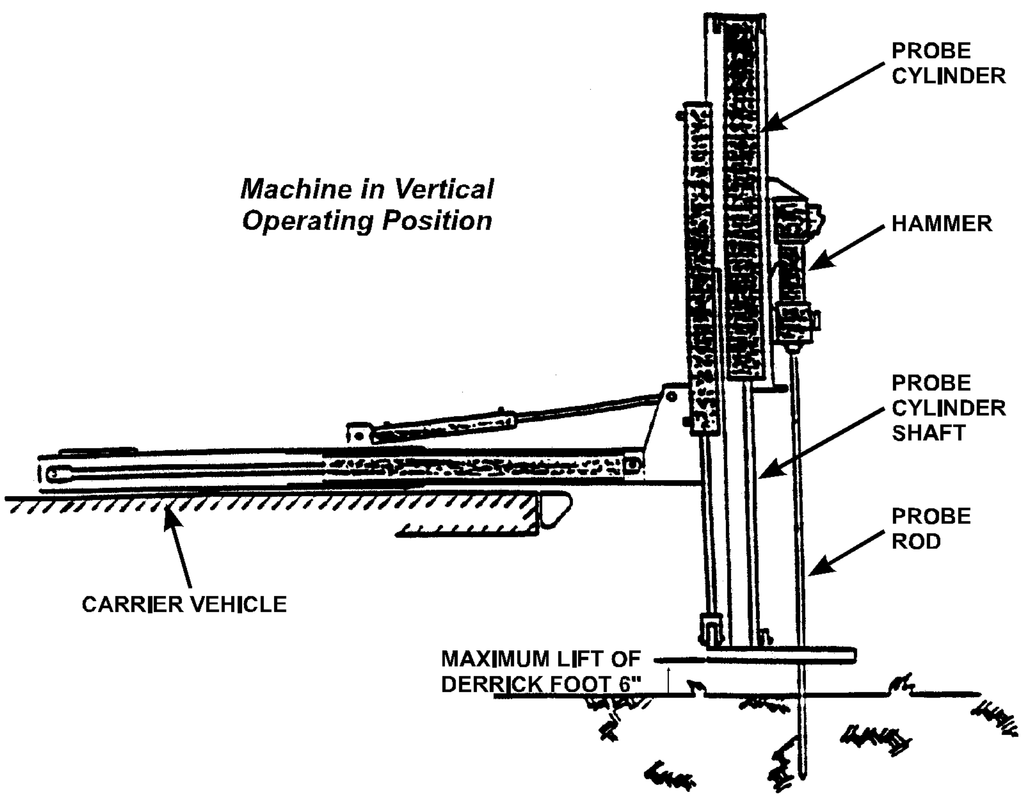
FIGURE 5. Inserting Hammer Anvil



APPENDIX A (Cont'd)

Figures

FIGURE 6. Probe Cylinder Shaft and Probe Rod - Parallel and Vertical



U. S. EPA ENVIRONMENTAL RESPONSE TEAM

STANDARD OPERATING PROCEDURES

SOIL SAMPLING

CONTENTS

SUPERCEDES: SOP #2012; Revision 0.0; 11/16/94; U.S. EPA Contract 68-C4-0022.

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to describe the procedures for the collection of representative soil samples. Sampling depths are assumed to be those that can be reached without the use of a drill rig, direct-push, or other mechanized equipment (except for a back-hoe). Analysis of soil samples may determine whether concentrations of specific pollutants exceed established action levels, or if the concentrations of pollutants present a risk to public health, welfare, or the environment.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the actual procedures used should be documented and described in an appropriate site report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Soil samples may be collected using a variety of methods and equipment depending on the depth of the desired sample, the type of sample required (disturbed vs. undisturbed), and the soil type. Near-surface soils may be easily sampled using a spade, trowel, and scoop. Sampling at greater depths may be performed using a hand auger, continuous flight auger, a trier, a split-spoon, or, if required, a backhoe.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Chemical preservation of solids is not generally recommended. Samples should, however, be cooled and protected from sunlight to minimize any potential reaction. The amount of sample to be collected and proper sample container type are discussed in ERT/REAC SOP #2003 Rev. 0.0 08/11/94, *Sample Storage, Preservation and Handling.*

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary potential problems associated with soil sampling - cross contamination of samples and improper sample collection. Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Improper sample collection can involve using contaminated equipment, disturbance of the matrix resulting in compaction of the sample, or inadequate homogenization of the samples where required, resulting in variable, non-representative results.

5.0 EQUIPMENT

Soil sampling equipment includes the following:

- Maps/plot plan
- Safety equipment, as specified in the site-specific Health and Safety Plan
- Survey equipment or global positioning system (GPS) to locate sampling points
- Tape measure
- Survey stakes or flags
- Camera and film
- Stainless steel, plastic, or other appropriate homogenization bucket, bowl or pan
- Appropriate size sample containers
- Ziplock plastic bags
- Logbook
- Labels
- Chain of Custody records and custody seals
- Field data sheets and sample labels
- Cooler(s)
- Ice
- Vermiculite
- Decontamination supplies/equipment
- Canvas or plastic sheet
- Spade or shovel
- Spatula
- Scoop
- Plastic or stainless steel spoons
- Trowel(s)
- Continuous flight (screw) auger
- Bucket auger
- Post hole auger
- Extension rods
- T-handle
- Sampling trier
- Thin wall tube sampler
- Split spoons
- Vehimeyer soil sampler outfit
  - Tubes
  - Points
  - Drive head
  - Drop hammer
  - Puller jack and grip
- Backhoe

6.0 REAGENTS

Reagents are not used for the preservation of soil samples. Decontamination solutions are specified in ERT/REAC SOP #2006 Rev. 0.0 08/11/94, *Sampling Equipment Decontamination*, and the site specific work plan.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies required.

2. Obtain necessary sampling and monitoring equipment.

3. Decontaminate or pre-clean equipment, and ensure that it is in working order.

4. Prepare schedules and coordinate with staff, client, and regulatory agencies, if appropriate.

5. Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.

6. Use stakes, flagging, or buoys to identify and mark all sampling locations. Specific site factors, including extent and nature of contaminant, should be considered when selecting sample location. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. All staked locations should be utility-cleared by the property owner or the On-Scene-Coordinator (OSC) prior to soil sampling; and utility clearance should always be confirmed before beginning work.

7.2 Sample Collection

7.2.1 Surface Soil Samples

Collection of samples from near-surface soil can be accomplished with tools such as spades, shovels, trowels, and scoops. Surface material is removed to the required depth and a stainless steel or plastic scoop is then used to collect the sample.

This method can be used in most soil types but is limited to sampling at or near the ground surface. Accurate, representative samples can be collected with this procedure depending on the care and precision demonstrated by the sample team member. A flat, pointed mason trowel to cut a block of the desired soil is helpful when undisturbed profiles are required. Tools plated with chrome or other materials should not be used. Plating is particularly common with garden implements such as potting trowels.

The following procedure is used to collect surface soil samples:

1. Carefully remove the top layer of soil or debris to the desired sample depth with a pre-cleaned spade.

2. Using a pre-cleaned, stainless steel scoop, plastic spoon, or trowel, remove and discard a thin layer of soil from the area which came in contact with the spade.

3. If volatile organic analysis is to be performed, transfer the sample directly into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.2 Sampling at Depth with Augers and Thin Wall Tube Samplers

This system consists of an auger, or a thin-wall tube sampler, a series of extensions, and a "T" handle (Figure 1, Appendix A). The auger is used to bore a hole to a desired sampling depth, and is then withdrawn. The sample may be collected directly from the auger. If a core sample is to be collected, the auger tip is then replaced with a thin wall tube sampler. The system is then lowered down the borehole, and driven into the soil to the completion depth. The system is withdrawn and the core is collected from the thin wall tube sampler.

Several types of augers are available; these include: bucket type, continuous flight (screw), and post-hole augers. Bucket type augers are better for direct sample recovery because they provide a large volume of sample in a short time. When continuous flight augers are used, the sample can be collected directly from the flights. The continuous flight augers are satisfactory when a composite of the complete soil column is desired. Post-hole augers have limited utility for sample collection as they are designed to cut through fibrous, rooted, swampy soil and cannot be used below a depth of approximately three feet.

The following procedure is used for collecting soil samples with the auger:

1. Attach the auger bit to a drill rod extension, and attach the "T" handle to the drill rod.

2. Clear the area to be sampled of any surface debris (e.g., twigs, rocks, litter). It may be advisable to remove the first three to six inches of surface soil for an area approximately six inches in radius around the drilling location.

3. Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet spread near the hole. This prevents accidental brushing of loose material back down the borehole when removing the auger or adding drill rods. It also facilitates refilling the hole, and avoids possible contamination of the surrounding area.

4. After reaching the desired depth, slowly and carefully remove the auger from the hole. When sampling directly from the auger, collect the sample after the auger is removed from the hole and proceed to Step 10.

5. Remove auger tip from the extension rods and replace with a pre-cleaned thin wall tube sampler. Install the proper cutting tip.

6. Carefully lower the tube sampler down the borehole. Gradually force the tube sampler into the soil. Do not scrape the borehole sides. Avoid hammering the rods as the vibrations may cause the boring walls to collapse.

7. Remove the tube sampler, and unscrew the drill rods.

8. Remove the cutting tip and the core from the device.

9. Discard the top of the core (approximately 1 inch), as this possibly represents material collected before penetration of the layer of concern. Place the remaining core into the appropriate labeled sample container. Sample homogenization is not required.

10. If volatile organic analysis is to be performed, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly.

    When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

11. If another sample is to be collected in the same hole, but at a greater depth, reattach the auger bit to the drill and assembly, and follow steps 3 through 11, making sure to decontaminate the auger and tube sampler between samples.

12. Abandon the hole according to applicable state regulations. Generally, shallow holes can simply be backfilled with the removed soil material.

7.2.3 Sampling with a Trier

The system consists of a trier, and a "T" handle. The auger is driven into the soil to be sampled and used to extract a core sample from the appropriate depth.

The following procedure is used to collect soil samples with a sampling trier:

1. Insert the trier (Figure 2, Appendix A) into the material to be sampled at a 0° to 45° angle from horizontal. This orientation minimizes the spillage of sample.

2. Rotate the trier once or twice to cut a core of material.

3. Slowly withdraw the trier, making sure that the slot is facing upward.

4. If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.4 Sampling at Depth with a Split Spoon (Barrel) Sampler

Split spoon sampling is generally used to collect undisturbed soil cores of 18 or 24 inches in length. A series of consecutive cores may be extracted with a split spoon sampler to give a complete soil column profile, or an auger may be used to drill down to the desired depth for sampling. The split spoon is then driven to its sampling depth through the bottom of the augured hole and the core extracted.

When split spoon sampling is performed to gain geologic information, all work should be performed in accordance with ASTM D1586-98, "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils".

The following procedures are used for collecting soil samples with a split spoon:

1. Assemble the sampler by aligning both sides of barrel and then screwing the drive shoe on the bottom and the head piece on top.

2. Place the sampler in a perpendicular position on the sample material.

3. Using a well ring, drive the tube. Do not drive past the bottom of the head piece or compression of the sample will result.

4. Record in the site logbook or on field data sheets the length of the tube used to penetrate the material being sampled, and the number of blows required to obtain this depth.

5. Withdraw the sampler, and open by unscrewing the bit and head and splitting the barrel. The amount of recovery and soil type should be recorded on the boring log. If a split sample is desired, a cleaned, stainless steel knife should be used to divide the tube contents in half, longitudinally. This sampler is typically available in 2 and 3 1/2 inch diameters. A larger barrel may be necessary to obtain the required sample volume.

6. Without disturbing the core, transfer it to appropriate labeled sample container(s) and seal tightly.

7.2.5 Test Pit/Trench Excavation

A backhoe can be used to remove sections of soil, when detailed examination of soil characteristics are required. This is probably the most expensive sampling method because of the relatively high cost of backhoe operation.

The following procedures are used for collecting soil samples from test pits or trenches:

1. Prior to any excavation with a backhoe, it is important to ensure that all sampling locations are clear of overhead and buried utilities.

2. Review the site specific Health & Safety plan and ensure that all safety precautions including appropriate monitoring equipment are installed as required.

3. Using the backhoe, excavate a trench approximately three feet wide and approximately one foot deep below the cleared sampling location. Place excavated soils on plastic sheets. Trenches greater than five feet deep must be sloped or protected by a shoring system, as required by OSHA regulations.

4. A shovel is used to remove a one to two inch layer of soil from the vertical face of the pit where sampling is to be done.

5. Samples are taken using a trowel, scoop, or coring device at the desired intervals. Be sure to scrape the vertical face at the point of sampling to remove any soil that may have fallen from above, and to expose fresh soil for sampling. In many instances, samples can be collected directly from the backhoe bucket.

6. If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7. Abandon the pit or excavation according to applicable state regulations. Generally, shallow excavations can simply be backfilled with the removed soil material.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance (QA) activities which apply to the implementation of these procedures. However, the following QA procedures apply:

1. All data must be documented on field data sheets or within site logbooks.

2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration

activities must occur prior to sampling/operation, and they must be documented.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OHSA and corporate health and safety procedures, in addition to the procedures specified in the site specific Health & Safety Plan..

12.0 REFERENCES

Mason, B.J. 1983. Preparation of Soil Sampling Protocol: Technique and Strategies. EPA-600/4-83-020.

Barth, D.S. and B.J. Mason. 1984. Soil Sampling Quality Assurance User's Guide. EPA-600/4-84-043.

U.S. Environmental Protection Agency. 1984 Characterization of Hazardous Waste Sites - A Methods Manual: Volume II. Available Sampling Methods, Second Edition. EPA-600/4-84-076.

de Vera, E.R., B.P. Simmons, R.D. Stephen, and D.L. Storm. 1980. Samplers and Sampling Procedures for Hazardous Waste Streams. EPA-600/2-80-018.

ASTM D 1586-98, ASTM Committee on Standards, Philadelphia, PA.

APPENDIX A
Figures
SOP #2012
February 2000

FIGURE 1. Sampling Augers

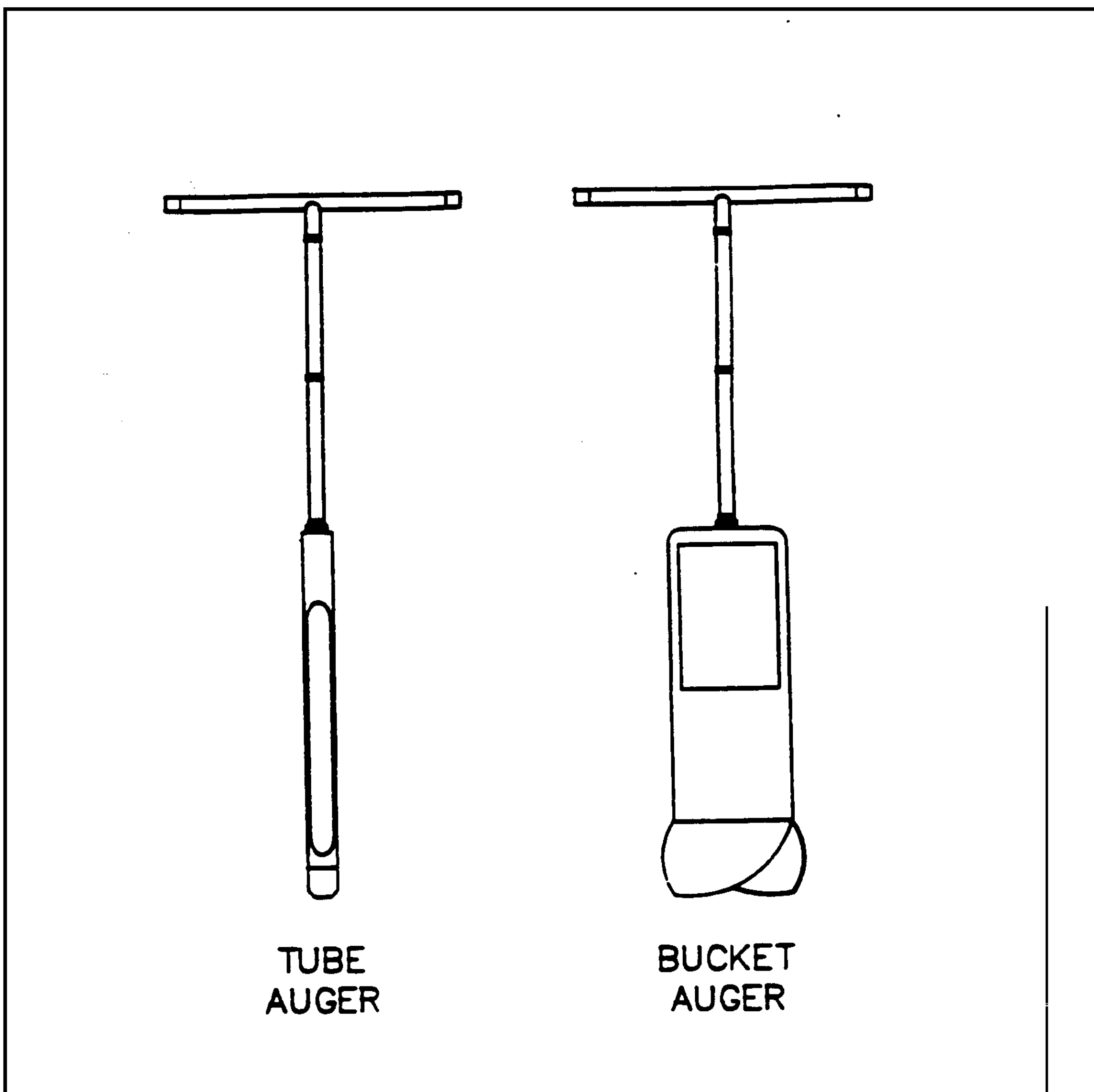
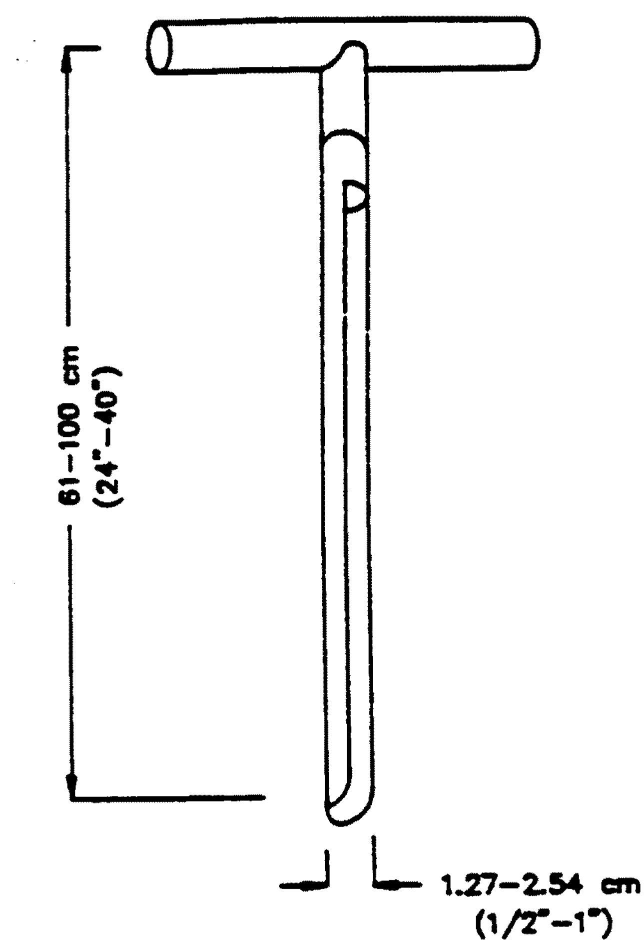


FIGURE 2. Sampling Trier



SAMPLING EQUIPMENT DECONTAMINATION

SOP#: 2006
DATE: 08/11/94
REV. #: 0.0

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to provide a description of the methods used for preventing, minimizing, or limiting cross-contamination of samples due to inappropriate or inadequate equipment decontamination and to provide general guidelines for developing decontamination procedures for sampling equipment to be used during hazardous waste operations as per 29 Code of Federal Regulations (CFR) 1910.120. This SOP does not address personnel decontamination.

These are standard (i.e. typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitation, or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (U.S. EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Removing or neutralizing contaminants from equipment minimizes the likelihood of sample cross contamination, reduces or eliminates transfer of contaminants to clean areas, and prevents the mixing of incompatible substances.

Gross contamination can be removed by physical decontamination procedures. These abrasive and non-abrasive methods include the use of brushes, air and wet blasting, and high and low pressure water cleaning.

The first step, a soap and water wash, removes all visible particulate matter and residual oils and grease. This may be preceded by a steam or high pressure water wash to facilitate residuals removal. The second step involves a tap water rinse and a distilled/deionized water rinse to remove the detergent. An acid rinse provides a low pH media for trace metals removal and is included in the decontamination process if metal samples are to be collected. It is followed by another distilled/deionized water rinse. If sample analysis does not include metals, the acid rinse step can be omitted. Next, a high purity solvent rinse is performed for trace organics removal if organics are a concern at the site. Typical solvents used for removal of organic contaminants include acetone, hexane, or water. Acetone is typically chosen because it is an excellent solvent, miscible in water, and not a target analyte on the Priority Pollutant List. If acetone is known to be a contaminant of concern at a given site or if Target Compound List analysis (which includes acetone) is to be performed, another solvent may be substituted. The solvent must be allowed to evaporate completely and then a final distilled/deionized water rinse is performed. This rinse removes any residual traces of the solvent.

The decontamination procedure described above may be summarized as follows:

1. Physical removal
2. Non-phosphate detergent wash
3. Tap water rinse
4. Distilled/deionized water rinse
5. 10% nitric acid rinse
6. Distilled/deionized water rinse
7. Solvent rinse (pesticide grade)
8. Air dry
9. Distilled/deionized water rinse

If a particular contaminant fraction is not present at the site, the nine (9) step decontamination procedure specified above may be modified for site specificity. For example, the nitric acid rinse may be eliminated if metals are not of concern at a site. Similarly, the solvent rinse may be eliminated if organics are not of concern at a site. Modifications to the standard procedure should be documented in the site specific work plan or subsequent report.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

The amount of sample to be collected and the proper sample container type (i.e., glass, plastic), chemical preservation, and storage requirements are dependent on the matrix being sampled and the parameter(s) of interest.
More specifically, sample collection and analysis of decontamination waste may be required before beginning proper disposal of decontamination liquids and solids generated at a site. This should be determined prior to initiation of site activities.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

- The use of distilled/deionized water commonly available from commercial vendors may be acceptable for decontamination of sampling equipment provided that it has been verified by laboratory analysis to be analyte free (specifically for the contaminants of concern).

- The use of an untreated potable water supply is not an acceptable substitute for tap water. Tap water may be used from any municipal or industrial water treatment system.

- If acids or solvents are utilized in decontamination they raise health and safety, and waste disposal concerns.

- Damage can be incurred by acid and solvent washing of complex and sophisticated sampling equipment.

5.0 EQUIPMENT/APPARATUS

Decontamination equipment, materials, and supplies are generally selected based on availability. Other considerations include the ease of decontaminating or disposing of the equipment. Most equipment and supplies can be easily procured. For example, soft-bristle scrub brushes or long-handled bottle brushes can be used to remove contaminants. Large galvanized wash tubs, stock tanks, or buckets can hold wash and rinse solutions. Children's wading pools can also be used. Large plastic garbage cans or other similar containers lined with plastic bags can help segregate contaminated equipment. Contaminated liquid can be stored temporarily in metal or plastic cans or drums.

The following standard materials and equipment are recommended for decontamination activities:

5.1 Decontamination Solutions

- Non-phosphate detergent
- Selected solvents (acetone, hexane, nitric acid, etc.)
- Tap water
- Distilled or deionized water

5.2 Decontamination Tools/Supplies

- Long and short handled brushes
- Bottle brushes
- Drop cloth/plastic sheeting
- Paper towels
- Plastic or galvanized tubs or buckets
- Pressurized sprayers (H_2O)
- Solvent sprayers
- Aluminum foil

5.3 Health and Safety Equipment

Appropriate personal protective equipment (i.e., safety glasses or splash shield, appropriate gloves, aprons or coveralls, respirator, emergency eye wash)

5.4 Waste Disposal

- Trash bags
- Trash containers
- 55-gallon drums
- Metal/plastic buckets/containers for storage and disposal of decontamination solutions

6.0 REAGENTS

There are no reagents used in this procedure aside from the actual decontamination solutions. Table 1 (Appendix A) lists solvent rinses which may be required for elimination of particular chemicals. In general, the following solvents are typically utilized for decontamination purposes:

- C 10% nitric acid is typically used for inorganic compounds such as metals. An acid rinse may not be required if inorganics are not a contaminant of concern.
- C Acetone (pesticide grade)(1)
- C Hexane (pesticide grade)(1)
- C Methanol(1)

(1) - Only if sample is to be analyzed for organics.

7.0 PROCEDURES

As part of the health and safety plan, a decontamination plan should be developed and reviewed. The decontamination line should be set up before any personnel or equipment enter the areas of potential exposure. The equipment decontamination plan should include:

- C The number, location, and layout of decontamination stations.
- C Decontamination equipment needed.
- C Appropriate decontamination methods.
- C Methods for disposal of contaminated clothing, equipment, and solutions.
- C Procedures can be established to minimize the potential for contamination. This may include: (1) work practices that minimize contact with potential contaminants; (2) using remote sampling techniques; (3) covering monitoring and sampling equipment with plastic, aluminum foil, or other protective material; (4) watering down dusty areas; (5) avoiding laying down equipment in areas of obvious contamination; and (6) use of disposable sampling equipment.

7.1 Decontamination Methods

All samples and equipment leaving the contaminated area of a site must be decontaminated to remove any contamination that may have adhered to equipment. Various decontamination methods will remove contaminants by: (1) flushing or other physical action, or (2) chemical complexing to inactivate contaminants by neutralization, chemical reaction, disinfection, or sterilization.

Physical decontamination techniques can be grouped into two categories: abrasive methods and non-abrasive methods, as follows:

7.1.1 Abrasive Cleaning Methods

Abrasive cleaning methods work by rubbing and wearing away the top layer of the surface containing the contaminant. The mechanical abrasive cleaning methods are most commonly used at hazardous waste sites. The following abrasive methods are available:

Mechanical

Mechanical methods of decontamination include using metal or nylon brushes. The amount and type of contaminants removed will vary with the hardness of bristles, length of time brushed, degree of brush contact, degree of contamination, nature of the surface being cleaned, and degree of contaminant adherence to the surface.

Air Blasting

Air blasting equipment uses compressed air to force abrasive material through a nozzle at high velocities. The distance between nozzle and surface cleaned, air pressure, time of application, and angle at which the abrasive strikes the surface will dictate cleaning efficiency. Disadvantages of this method are the inability to control the amount of material removed and the large amount of waste generated.

Wet Blasting

Wet blast cleaning involves use of a suspended fine abrasive. The abrasive/water mixture is delivered by compressed air to the contaminated area. By using a very fine abrasive, the amount of materials removed can be carefully controlled.

7.1.2 Non-Abrasive Cleaning Methods

Non-abrasive cleaning methods work by forcing the contaminant off a surface with pressure. In general, the equipment surface is not removed using non-abrasive methods.

Low-Pressure Water

This method consists of a container which is filled with water. The user pumps air out of the container to create a vacuum. A slender nozzle and hose allow the user to spray in hard-to-reach places.

High-Pressure Water

This method consists of a high-pressure pump, an operator controlled directional nozzle, and a high-pressure hose. Operating pressure usually ranges from 340 to 680 atmospheres (atm) and flow rates usually range from 20 to 140 liters per minute.

Ultra-High-Pressure Water

This system produces a water jet that is pressured from 1,000 to 4,000 atmospheres. This ultra-high-pressure spray can remove tightly-adhered surface films. The water velocity ranges from 500 meters/second (m/s) (1,000 atm) to 900 m/s (4,000 atm). Additives can be used to enhance the cleaning action.

Rinsing

Contaminants are removed by rinsing through dilution, physical attraction, and solubilization.

Damp Cloth Removal

In some instances, due to sensitive, non-waterproof equipment or due to the unlikelihood of equipment being contaminated, it is not necessary to conduct an extensive decontamination procedure. For example, air sampling pumps hooked on a fence, placed on a drum, or wrapped in plastic bags are not likely to become heavily contaminated. A damp cloth should be used to wipe off contaminants which may have adhered to equipment through airborne contaminants or from surfaces upon which the equipment was set.

Disinfection/Sterilization

Disinfectants are a practical means of inactivating infectious agents. Unfortunately, standard sterilization methods are impractical for large equipment. This method of decontamination is typically performed off-site.

7.2 Field Sampling Equipment Decontamination Procedures

The decontamination line is setup so that the first station is used to clean the most contaminated item. It progresses to the last station where the least contaminated item is cleaned. The spread of contaminants is further reduced by separating each decontamination station by a minimum of three (3) feet. Ideally, the contamination should decrease as the equipment progresses from one station to another farther along in the line.

A site is typically divided up into the following boundaries: Hot Zone or Exclusion Zone (EZ), the Contamination Reduction Zone (CRZ), and the Support or Safe Zone (SZ). The decontamination line should be setup in the Contamination Reduction Corridor (CRC) which is in the CRZ. Figure 1 (Appendix B) shows a typical contaminant reduction zone layout. The CRC controls access into and out of the exclusion zone and confines decontamination activities to a limited area. The CRC boundaries should be conspicuously marked. The far end is the hotline, the boundary between the exclusion zone and the contamination reduction zone. The size of the decontamination corridor depends on the number of stations in the decontamination process, overall dimensions of the work zones, and amount of space available at the site. Whenever possible, it should be a straight line.

Anyone in the CRC should be wearing the level of protection designated for the decontamination crew. Another corridor may be required for the entry and exit of heavy equipment. Sampling and monitoring equipment and sampling supplies are all maintained outside of the CRC. Personnel don their equipment away from the CRC and enter the exclusion zone through a separate access control point at the hotline. One person (or more) dedicated to decontaminating equipment is recommended.

7.2.1 Decontamination Setup

Starting with the most contaminated station, the decontamination setup should be as follows:

Station 1: Segregate Equipment Drop

Place plastic sheeting on the ground (Figure 2, Appendix B). Size will depend on amount of equipment to be decontaminated. Provide containers lined with plastic if equipment is to be segregated. Segregation may be required if sensitive equipment or mildly contaminated equipment is used at the same time as equipment which is likely to be heavily contaminated.

Station 2: Physical Removal With A High-Pressure Washer (Optional)

As indicated in 7.1.2, a high-pressure wash may be required for compounds which are difficult to remove by washing with brushes. The elevated temperature of the water from the high-pressure washers is excellent at removing greasy/oily compounds. High pressure washers require water and electricity.

A decontamination pad may be required for the high-pressure wash area. An example of a wash pad may consist of an approximately 1 1/2 foot-deep basin lined with plastic sheeting and sloped to a sump at one corner. A layer of sand can be placed over the plastic and the basin is filled with gravel or shell. The sump is also lined with visqueen and a barrel is placed in the hole to prevent collapse. A sump pump is used to remove the water from the sump for transfer into a drum.

Typically heavy machinery is decontaminated at the end of the day unless site sampling requires that the machinery be decontaminated frequently. A separate decontamination pad may be required for heavy equipment.

Station 3: Physical Removal With Brushes And A Wash Basin

Prior to setting up Station 3, place plastic sheeting on the ground to cover areas under Station 3 through Station 10.
Fill a wash basin, a large bucket, or child's swimming pool with non-phosphate detergent and tap water. Several bottle and bristle brushes to physically remove contamination should be dedicated to this station . Approximately 10 - 50 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 4: Water Basin

Fill a wash basin, a large bucket, or child's swimming pool with tap water. Several bottle and bristle brushes should be dedicated to this station. Approximately 10-50 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 5: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to contain the water during the rinsing process. Approximately 10-20 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 6: Nitric Acid Sprayers

Fill a spray bottle with 10% nitric acid. An acid rinse may not be required if inorganics are not a contaminant of concern. The amount of acid will depend on the amount of equipment to be decontaminated. Provide a 5-gallon bucket or basin to collect acid during the rinsing process.

Station 7: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to collect water during the rinsate process.

Station 8: Organic Solvent Sprayers

Fill a spray bottle with an organic solvent. After each solvent rinse, the equipment should be rinsed with distilled/deionized water and air dried. Amount of solvent will depend on the amount of equipment to decontaminate. Provide a 5-gallon bucket or basin to collect the solvent during the rinsing process.

Solvent rinses may not be required unless organics are a contaminant of concern, and may be eliminated from the station sequence.

Station 9: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to collect water during the rinsate process.

Station 10: Clean Equipment Drop

Lay a clean piece of plastic sheeting over the bottom plastic layer. This will allow easy removal of the plastic in the event that it becomes dirty. Provide aluminum foil, plastic, or other protective material to wrap clean equipment.

7.2.2 Decontamination Procedures

Station 1: Segregate Equipment Drop

Deposit equipment used on-site (i.e., tools, sampling devices and containers, monitoring instruments radios, clipboards, etc.) on the plastic drop cloth/sheet or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross contamination. Loose leaf sampling data sheets or maps can be placed in plastic zip lock bags if contamination is evident.

Station 2: Physical Removal With A High-Pressure Washer (Optional)

Use high pressure wash on grossly contaminated equipment. Do not use high- pressure wash on sensitive or non-waterproof equipment.

Station 3: Physical Removal With Brushes And A Wash Basin

Scrub equipment with soap and water using bottle and bristle brushes. Only sensitive equipment (i.e., radios, air monitoring and sampling equipment) which is waterproof should be washed. Equipment which is not waterproof should have plastic bags removed and wiped down with a damp cloth. Acids and organic rinses may also ruin sensitive equipment. Consult the manufacturers for recommended decontamination solutions.

Station 4: Equipment Rinse

Wash soap off of equipment with water by immersing the equipment in the water while brushing. Repeat as many times as necessary.

Station 5: Low-Pressure Rinse

Rinse sampling equipment with distilled/deionized water with a low-pressure sprayer.

Station 6: Nitric Acid Sprayers (required only if metals are a contaminant of concern)

Using a spray bottle rinse sampling equipment with nitric acid. Begin spraying (inside and outside) at one end of the equipment allowing the acid to drip to the other end into a 5-gallon bucket. A rinsate blank may be required at this station. Refer to Section 9.

Station 7: Low-Pressure Sprayers

Rinse sampling equipment with distilled/deionized water with a low-pressure sprayer.

Station 8: Organic Solvent Sprayers

Rinse sampling equipment with a solvent. Begin spraying (inside and outside) at one end of the equipment allowing the solvent to drip to the other end into a 5-gallon bucket. Allow the solvent to evaporate from the equipment before going to the next station. A QC rinsate sample may be required at this station.

Station 9: Low-Pressure Sprayers

Rinse sampling equipment with distilled/deionized water with a low-pressure washer.

Station 10 : Clean Equipment Drop

Lay clean equipment on plastic sheeting. Once air dried, wrap sampling equipment with aluminum foil, plastic, or other protective material.

7.2.3 Post Decontamination Procedures

1. Collect high-pressure pad and heavy equipment decontamination area liquid and waste and store in appropriate drum or container. A sump pump can aid in the collection process. Refer to the Department of Transportation (DOT) requirements for appropriate containers based on the contaminant of concern.

2. Collect high-pressure pad and heavy equipment decontamination area solid waste and store in appropriate drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

3. Empty soap and water liquid wastes from basins and buckets and store in appropriate

drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

4. Empty acid rinse waste and place in appropriate container or neutralize with a base and place in appropriate drum. pH paper or an equivalent pH test is required for neutralization. Consult DOT requirements for appropriate drum for acid rinse waste.

5. Empty solvent rinse sprayer and solvent waste into an appropriate container. Consult DOT requirements for appropriate drum for solvent rinse waste.

6. Using low-pressure sprayers, rinse basins, and brushes. Place liquid generated from this process into the wash water rinse container.

7. Empty low-pressure sprayer water onto the ground.

8. Place all solid waste materials generated from the decontamination area (i.e., gloves and plastic sheeting, etc.) in an approved DOT drum. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

9. Write appropriate labels for waste and make arrangements for disposal. Consult DOT regulations for the appropriate label for each drum generated from the decontamination process.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITYASSURANCE/ QUALITY CONTROL

A rinsate blank is one specific type of quality control sample associated with the field decontamination process. This sample will provide information on the effectiveness of the decontamination process employed in the field.

Rinsate blanks are samples obtained by running analyte free water over decontaminated sampling equipment to test for residual contamination. The blank water is collected in sample containers for handling, shipment, and analysis. These samples are treated identical to samples collected that day. A rinsate blank is used to assess cross contamination brought about by improper decontamination procedures. Where dedicated sampling equipment is not utilized, collect one rinsate blank per day per type of sampling device samples to meet QA2 and QA3 objectives.

If sampling equipment requires the use of plastic tubing it should be disposed of as contaminated and replaced with clean tubing before additional sampling occurs.

10.0 DATA VALIDATION

Results of quality control samples will be evaluated for contamination. This information will be utilized to qualify the environmental sample results in accordance with the project's data quality objectives.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow OSHA, U.S. EPA, corporate, and other applicable health and safety procedures.

Decontamination can pose hazards under certain circumstances. Hazardous substances may be incompatible with decontamination materials. For example, the decontamination solution may react with contaminants to produce heat, explosion, or toxic products. Also, vapors from decontamination solutions may pose a direct health hazard to workers by inhalation, contact, fire, or explosion.

The decontamination solutions must be determined to be acceptable before use. Decontamination materials may degrade protective clothing or equipment; some solvents can permeate protective clothing. If decontamination materials do pose a health hazard, measures should be taken to protect personnel or substitutions should be made to eliminate the hazard. The choice of respiratory protection based on contaminants of concern from the site may not be appropriate for solvents used in the decontamination process.

Safety considerations should be addressed when using abrasive and non-abrasive decontamination equipment. Maximum air pressure produced by abrasive equipment could cause physical injury. Displaced material requires control mechanisms.

Material generated from decontamination activities requires proper handling, storage, and disposal. Personal Protective Equipment may be required for these activities.

Material safety data sheets are required for all decontamination solvents or solutions as required by the Hazard Communication Standard (i.e., acetone, alcohol, and trisodiumphosphate).

In some jurisdictions, phosphate containing detergents (i.e., TSP) are banned.

12.0 REFERENCES

Field Sampling Procedures Manual, New Jersey Department of Environmental Protection, February, 1988.

A Compendium of Superfund Field Operations Methods, EPA 540/p-87/001.

Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, USEPA Region IV, April 1, 1986.

Guidelines for the Selection of Chemical Protective Clothing, Volume 1, Third Edition, American Conference of Governmental Industrial Hygienists, Inc., February, 1987.

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/USCG/EPA, October, 1985.

APPENDIX A

Table

Table 1. Soluble Contaminants and Recommended Solvent Rinse

TABLE 1 Soluble Contaminants and Recommended Solvent Rinse		
SOLVENT[(1)]	EXAMPLES OF SOLVENTS	SOLUBLE CONTAMINANTS
Water	Deionized water Tap water	Low-chain hydrocarbons Inorganic compounds Salts Some organic acids and other polar compounds
Dilute Acids	Nitric acid Acetic acid Boric acid	Basic (caustic) compounds (e.g., amines and hydrazines)
Dilute Bases	Sodium bicarbonate (e.g., soap detergent)	Acidic compounds Phenol Thiols Some nitro and sulfonic compounds
Organic Solvents [(2)]	Alcohols Ethers Ketones Aromatics Straight chain alkalines (e.g., hexane) Common petroleum products (e.g., fuel, oil, kerosene)	Nonpolar compounds (e.g., some organic compounds)
Organic Solvent[(2)]	Hexane	PCBs

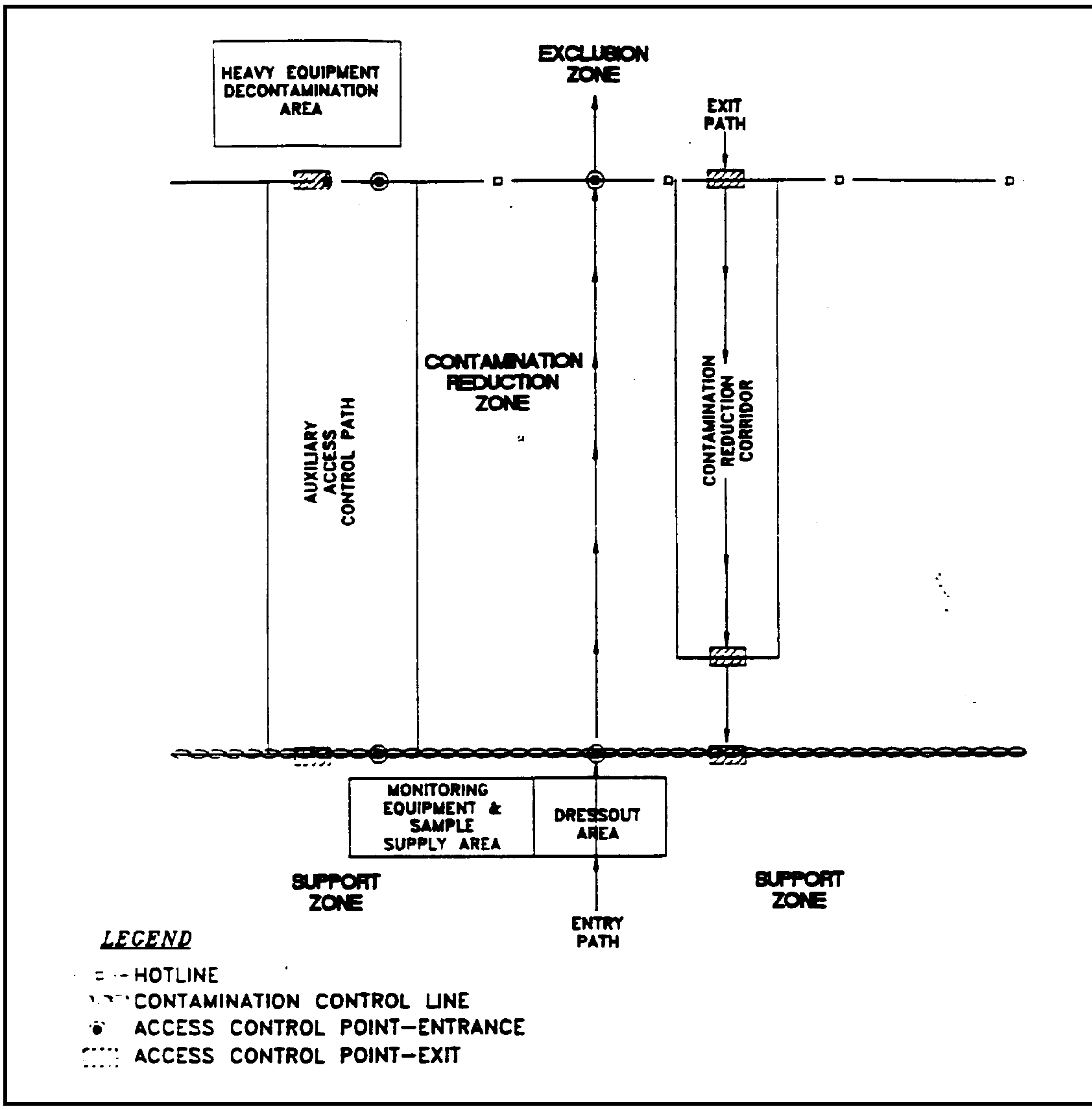
[(1)] - Material safety data sheets are required for all decontamination solvents or solutions as required by the Hazard Communication Standard

[(2)] - WARNING: Some organic solvents can permeate and/or degrade the protective clothing

APPENDIX B

Figures

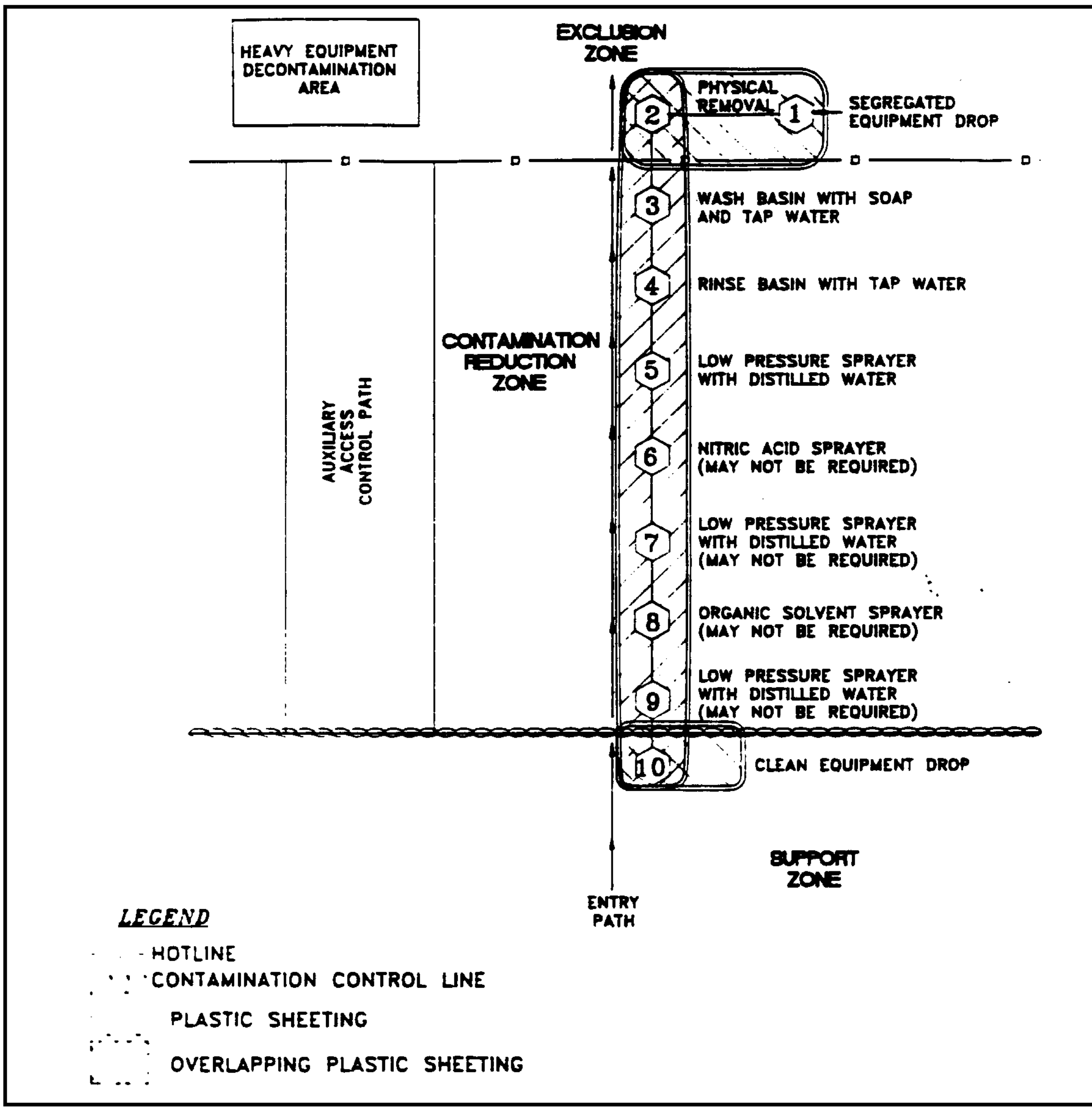
Figure 1. Contamination Reduction Zone Layout



APPENDIX B (Cont'd.)

Figures

Figure 2. Decontamination Layout



APPENDIX C
SITE-SPECIFIC HEALTH AND SAFETY PLAN

SITE HEALTH AND SAFETY PLAN (HASP)-FORM 1

Prepared by: Rivian Villanueva	**W.O. Number:** 20409.012.002.0009.00	**Date:** July 29, 2014

Project Identification
Office: Walnut Creek, CA
Site Name: Haystack Mine No. 1 Removal Assessment
Client: USEPA
Work Location Address: Navajo Nation, Haystack Chapter, McKinley County, New Mexico

Site History:
Portions of the Navajo Nations are located on geologic formations rich in radioactive uranium ores. Beginning in the 1940s, widespread mining and milling of uranium ore for national defense and energy purposes on Navajo tribal lands led to a legacy of Abandoned Uranium Mines (AUMs). Previous investigations at the AUMs, in particular, Haystack No. 1, Section 24, and Bibo Trespass, for gamma radiation have indicated that levels are present in on-site soils exceeding background levels.

Scope of Work:
Conduct a comprehensive lateral ground surfac e gamma radiation survey at AUM sites (Haystack No. 1, Section 24, and Bibo Trespass), an evaluation of vertical subsurface gamma radiation levels up to 10 feet below ground surface at the AUM sites, a n evaluation of typical background gamma radiation levels in the surrounding area and collection of soil samples for Radium -226 (Ra-226) laboratory analysis.

☐ Site visit only; site HASP not necessary. List personnel here and sign off below:

Regulatory Status:

Site regulatory status:

CERCLA/SARA	**RCRA**	**Other Federal Agency**
☒ U.S. EPA	☐ U.S. EPA	☐ DOE
☐ State	☐ State	☐ USACE
☐ NPL Site	**NRC**	☐ Air Force
☐ OSHA	☐ 10 CFR 20	☐ ______

☐ Hazard Communication (Req'd See Attachment D)
☐ 1910 ☐ 1926 ☐ State

☐ Safety Officer Manual (Required to be On-Site)

Based on the Hazard Assessment and Regulatory Status, determine the Standard HASP(s) applicable to this project. Indicate below which Standard HASP will be used and append the appropriate pages of this form along with the Standard Plan.

☐ Stack Test	☐ ____________
☐ Air Emissions	☐ ____________
☐ Asbestos	☐ ____________
☐ Industrial Hygiene	☐ ____________
☐ ____________	☐ ____________

Review and Approval Documentation:

Reviewed by:
SO/DSM/CHS Alex Grubb Date: 07/29/14
Name (Print) Signature

Approved by:
Project Manager Alex Grubb Date: 07/29/14
Name (Print) Signature

Hazard Assessment and Equipment Selection:

In accordance with WESTON's Personal Protective Equipment Program and 29 CFR 1910.132, at the site prior to personnel beginning work, the SHSC and/or the Site Manager have evaluated conditions and verified that the personal protective equipment selection outlined within this HASP is appropriate for the hazards known or expected to exist. (Refer to Safety Officer Manual Section 2, Personal Protection Program, for guidance.)

☐ SHSC ☒ Site Manager Alex Grubb Date: 7/29/14
Name (Print) Signature

Project start date: August 11, 2014 End date: August 30, 2014	This site HASP **must** be **reissued/reapproved** for any activities conducted after: Date: 12/31/2014	Amendment date(s) By: 1. 2. 3. 4.

WESTON REPRESENTATIVES-FORM 2

Organization/Branch	Name/Title	Address	Telephone
WESTON/Walnut Creek	Joe De Fao Program Manager	1340 Treat Blvd., Suite 210 Walnut Creek, CA 94597	(925) 948-2677
WESTON/Walnut Creek	Alex Grubb Project Manager, Health and Safety Officer, Field Manager	1340 Treat Blvd., Suite 210 Walnut Creek, CA 94597	(925) 948-2655

Roles and Responsibilities : The Project Manager is responsible for management of the site investigation work assignment. The Field Sampling QC Coordinator is responsible for making sure that field QC requirements are met during the sampling event. The Field Manager is responsible for completion of technical and field activities associated with this site investigation.

WESTON SUBCONTRACTORS

Organization/Branch	Name/Title	Address	Telephone
Laboratory	Test America–St Louis	13715 Rider Trail North	(314)298-8566

Roles and Responsibilities: The laboratory will perform Ra-226 analysis for surface and subsurface soil samples.

SITE-SPECIFIC HEALTH AND SAFETY PERSONNEL

The Site Health and Safety Coordinator (SHSC) for activities to be conducted at this site is: Alex Grubb

The SHSC has total responsibility for ensuring that the provisions of this Site HASP are adequate and implemented in the field.

Changing field conditions may require decisions to be made concerning adequate protection programs. Therefore, the personnel assigned as SHSCs are experienced and meet the additional training requirements specified by OSHA in 29 CFR 1910.120.

Qualifications: 40-Hour HAZWOPER, current 8-Hour HAZWOPER Refresher, SHSC (D), First Aid, CPR, BBP

Designated alternates include: Tom Fortner / Alex Grubb

The Dangerous Goods Shipper for activities to be conducted at this site is: ______________________________

☒ Dangerous Goods Shipping not required for this site because only environmental samples will be shipped.

Qualifications:

Designated alternates include:

The Environmental Compliance Officer (ECO) for activities to be conducted at this site is: Alex Grubb

The ECO has total responsibility for ensuring that the provisions of the Site EC Plan are adequate and implemented in the field.

Qualifications: Hazardous Waste Management & Shipping for Environmental Professionals

Designated alternates include:

HEALTH AND SAFETY EVALUATION-FORM 3

Hazard Assessment

Background Review: ☒ Complete ☐ Partial If partial why?

Activities Covered Under This Plan:

No.	Task/Subtask	Description	Schedule
1	Gamma Scanning	Determine the typical background levels for gamma radiation activity in areas surrounding the site and lateral ground surface boundaries where elevated gamma radiation activity is present at the site.	08/11/14-08/20/14
2	Subsurface Data Logging	Evaluate the vertical subsurface extent (up to 10 feet below ground surface) where elevated gamma radiation activity is present at the site.	08/11/14-08/20/14
3	Soil Sampling	Twenty (20) surface and 12 subsurface soil samples will be collected at the site.	08/11/14-08/20/14

Types of Hazards:

The number 1 refers to one of the following hazard evaluation forms. Complete hazard evaluation forms for each appropriate hazard class.

Physiochemical 1

☐ Flammable
☐ Explosive
☐ Corrosive
☐ Reactive

☐ O_2 Rich
☐ O_2 Deficient

Chemically Toxic 1

☒ Inhalation ☒ Carcinogen
☒ Ingestion ☐ Mutagen
☐ Contact ☐ Teratogen
☐ Absorption

☐ OSHA 1910.1000 Substance (Air Contaminants)

☒ OSHA Specific Hazard Substance Standard (Refer to following page for listing)

Radiation 3

Ionizing:
☐ Internal exposure
☒ External exposure

Non-ionizing:
☒ UV ☐ IR
☐ RF ☐ MicroW
☐ Laser

Biological 2

☐ Etiological Agent
☒ Other (plant, insect, animal)

☒ **Physical Hazards 4**
☐ Construction Activities

Source/Location of Contaminants and Hazardous Substances:

Directly Related to Tasks

☐ Air
☐ Other Surface
☐ Groundwater
☒ Soil
☐ Surface Water
☐ Sanitary Wastewater
☐ Process Wastewater
☒ Other

Indirectly Related to Tasks — Nearby Process(es) That Could Affect Team Members:

☐ Client Facility/WESTON Work Location
☐ Nearby Non-Client Facility
Describe:
☐ Have activities (task[s]) been coordinated with facility?

HEALTH AND SAFETY EVALUATION—CHEMICAL HAZARDS OF CONCERN-FORM 4 (REVISED 02/1998)

<table>
<tr><td colspan="2">☐ N/A

<u>Chemical Contaminants of Concern</u>

Provide the data requested for chemical contaminants on HASP Form 25 or attach data sheets from an acceptable source such as NIOSH pocket guide, condensed chemical dictionary, ACGIH TLV booklet, etc. List chemicals and concentrations below and locate data sheets in Attachment B of this HASP.</td><td colspan="2">☐ N/A

Identify hazardous materials used or on -site and attach Material Safety Data Sheets (MSDSs) for all reagent type chemicals, solutions, or other identified materials that in normal use in performing tasks related to this project could produce hazardous substances. Ensure that all subcontractors and other parties working nearby are informed of the presence of these chemicals and the location of the MSDSs. Obtain from subcontractors and other parties, lists of the hazardous materials t hey use or have on-site and identify location of the MSDSs here. List chemicals and quantities below and locate MSDSs in Attachment B of this HASP.</td></tr>
<tr><td>Chemical Name</td><td>Concentration (if known)</td><td>Chemical Name</td><td>Quantity</td></tr>
<tr><td>Ra-226</td><td></td><td></td><td></td></tr>
</table>

OSHA-SPECIFIC HAZARDOUS SUBSTANCES

The following substances may require specific medical, training, or monitoring based on concentration or evaluation of risk. See the appropriate citation listed under 29 CFR 1910 or 1926 for additional information.

☐ 1910.1001 Asbestos	☐ 1910.1002 Coal tar pitch volatiles	☐ 1910.1003 4-Nitrobiphenyl, etc.	☐ 1910.1004 alpha-Naphthylamine
☐ 1910.1005 [Reserved]	☐ 1910.1006 Methyl chloromethyl ether	☐ 1910.1007 3,3'-Dichlorobenzidine (and its salts)	☐ 1910.1008 bis-Chloromethyl ether
☐ 1910.1009 beta-Naphthylamine	☐ 1910.1010 Benzidine	☐ 1910.1011 4-Aminodiphenyl	☐ 1910.1012 Ethyleneimine
☐ 1910.1013 beta-Propiolactone	☐ 1910.1014 2-Acetylaminofluorene	☐ 1910.1015 4-Dimethylaminoazobenzene	☐ 1910.1016 N-Nitrosodimethylamine
☐ 1910.1017 Vinyl chloride	☐ 1910.1018 Inorganic arsenic	☐ 1910.1025 Lead (Att. FLD# 46)	☐ 1910.1027 Cadmium
☐ 1910.1028 Benzene	☐ 1910.1029 Coke oven emissions	☐ 1910.1043 Cotton dust	☐ 1910.1044 1,2-Dibromo-3-chloropropane
☐ 1910.1045 Acrylonitrile	☐ 1910.1047 Ethylene oxide	☐ 1910.1048 Formaldehyde	☐ 1910.1050 Methylenedianiline
☐ 1910.1051 1,3 Butadiene	☐ 1910.1052 Methylene chloride		

HEALTH AND SAFETY EVALUATION — 2 BIOLOGICAL HAZARDS OF CONCERN-FORM 5

☒ **Poisonous Plants** (FLD 43)

Location/Task No(s).:
Source: ☐ Known ☒ Suspect
Route of Exposure: ☒ Inhalation ☐ Ingestion ☒ Contact ☐ Direct Penetration

Team Member(s) Allergic: ☒ Yes ☐ No
Immunization required: ☐ Yes ☒ No

☒ **Insects** (FLD 43)

Location/Task No(s).:
Source: ☐ Known ☒ Suspect
Route of Exposure: ☐ Inhalation ☐ Ingestion ☐ Contact ☒ Direct Penetration

Team Member(s) Allergic: ☒ Yes ☐ No
Immunization required: ☐ Yes ☒ No

☒ **Snakes, Reptiles** (FLD 43)

Location/Task No(s).:
Source: ☒ Known ☐ Suspect
Route of Exposure: ☐ Inhalation ☐ Ingestion ☐ Contact ☒ Direct Penetration

Team Member(s) Allergic: ☒ Yes ☐ No
Immunization required: ☐ Yes ☒ No

☒ **Animals** (FLD 43)

Location/Task No(s).:
Source: ☐ Known ☒ Suspect
Route of Exposure: ☐ Inhalation ☐ Ingestion ☒ Contact ☐ Direct Penetration

Team Member(s) Allergic: ☐ Yes ☒ No
Immunization required: ☐ Yes ☒ No

FLD 43 — WESTON Biohazard Field Operating Procedures: Att. OP ☐

☐ **Sewage**

Location/Task No(s).:
Source: ☐ Known ☐ Suspect
Route of Exposure: ☐ Inhalation ☐ Ingestion ☐ Contact ☐ Direct Penetration

Team Member(s) Allergic: ☐ Yes ☐ No
Immunization required: ☐ Yes ☐ No

Tetanus Vaccination within Past 10 yrs: ☐ Yes ☐ No

☐ **Etiologic Agents (List)**

Location/Task No(s).:
Source: ☐ Known ☐ Suspect
Route of Exposure: ☐ Inhalation ☐ Ingestion ☐ Contact ☐ Direct Penetration

Team Member(s) Allergic: ☐ Yes ☐ No
Immunization required: ☐ Yes ☐ No

FLD 44 — WESTON Bloodborne Pathogens Exposure Control Plan – First Aid Procedures: Att. OP ☒

FLD 45 — WESTON Bloodborne Pathogens Exposure Control Plan – Working with Infectious Waste: Att. OP ☐

HEALTH AND SAFETY EVALUATION — 3 RADIATION HAZARDS OF CONCERN-FORM 6 (REVISED 02/1998)

NONIONIZING RADIATION

Task No.	Type of Nonionizing Radiation	Source On-Site	TLV/PEL	Wavelength Range	Control Measures	Monitoring Instrument
1-3	Ultraviolet	Sun			Sunscreen, stay hydrated	
N/A	Infrared					
N/A	Radio Frequency					
N/A	Microwave					
N/A	Laser					

IONIZING RADIATION

Task No.	Radionuclide	Major Radiations	Radioactive Half-Life (Years)	DAC (µCii/mL)			Surface Contamination Limit	Monitoring Instrument
				D	W	Y		
1-3	U^{238}	Ra-226	1,600					Electronic Personal Dosimeter

HEALTH AND SAFETY EVALUATION — 4 PHYSICAL HAZARDS OF CONCERN-FORM 7			
Phy. Haz. Cond.	**Physical Hazard**	**Attach OP**	**WESTON OP Titles**
Loud noise	Hearing loss/disruption of communication	☒	FLD01 - Noise Protection
Inclement weather	Rain/humidity/cold/ice/snow/lightning	☒	FLD02 - Inclement Weather
Steam heat stress	Burns/displaced oxygen/wet working surfaces	☐	FLD03 - Hot Process- Steam
Heat stress	Burns/hot surfaces/low pressure steam	☐	FLD04 - Hot Process- LT3
Ambient heat stress	Heat rash/cramps/exhaustion/heat stroke	☒	FLD05 - Heat Stress Prevention/Monitoring
Cold stress	Hypothermia/frostbite	☐	FLD06 - Cold Stress
Cold/wet	Trench/paddy/immersion foot/edema	☐	FLD07 - Wet Feet
Confined spaces	Falls/burns/drowning/engulfment/electrocution	☐	FLD08 - Confined Space Entry
Explosive vapors	Thermal burns/impaction/dismemberment	☐	FLD09 - Hot Work
Improper lifting	Back strain/abdomen/arm/leg muscle/joint injury	☒	FLD10 - Manual Lifting/Handling Heavy Objects
Uneven surfaces	Vehicle accidents/slips/trips/falls	☒	FLD11 - Rough Terrain
Poor housekeeping	Slips/trips/falls/punctures/cuts/fires	☒	FLD12 - Housekeeping
Structural integrity	Crushing/overhead hazards/compromised floors	☐	FLD13 - Structural Integrity
Hostile persons	Bodily injury	☐	FLD14 - Site Security
Remote area	Slips/trips/falls/back strain/communication	☐	FLD15 - Remote Area
Improper cyl. handling	Mechanical injury/fire/explosion/suffocation	☐	FLD16 - Pressure Systems- Compressed Gases
Water hazards	Poor visibility/entanglement/drowning/cold stress	☐	FLD17 – Diving
Water hazards	Drowning/heat/cold stress/hypothermia/falls	☐	FLD18 - Operation and Use of Boats
Water hazards	Drowning/frostbite/hypothermia/falls/electrocution	☐	FLD19 - Working Over Water
Vehicle hazards	Struck by vehicle/collision	☐	FLD20 – Traffic
Explosions	Explosion/fire/thermal burns	☐	FLD21 – Explosives
Moving mechanical parts	Crushing/pinch points/overhead hazards/electrocution	☒	FLD22 - Heavy Equipment Operation
Moving mech. parts	Overhead hazards/electrocution	☐	FLD23 - Cranes/Lifting Equipment Operation
Working at elevation	Overhead hazardsfalls/electrocution	☐	FLD24 - Aerial Lifts/Manlifts
Working at elevation	Overhead hazards/falls/electrocution	☐	FLD25 - Working at Elevation
Working at elevation	Overhead hazards/falls/electrocution/slips	☐	FLD26 – Ladders
Working at elevation	Slips/trips/falls/overhead hazards	☐	FLD27 – Scaffolding
Trench cave-in	Crushing/falling/overhead hazards/suffocation	☐	FLD28 - Excavating/Trenching
Improper materialhandling	Back injury/crushing from load shifts	☐	FLD29 - Materials Handling
Physiochemical	Explosions/fires from oxidizing, flam./corr. Material	☐	FLD30 - Hazardous Materials Use/Storage
Physiochemical	Fire and explosion	☐	FLD31 - Fire Prevention/Response Plan Required
Physiochemical	Fire	☐	FLD32 - Fire Extinguishers Required
Structural integrity	Overhead/electrocution/slips/trips/falls/fire	☐	FLD33 – Demolition
Electrical	Electrocution/shock/thermal burns	☒	FLD34 – Utilities
Electrical	Electrocution/shock/thermal burns	☐	FLD35 - Electrical Safety
Burns/fires	Heat stress/fires/burns	☐	FLD36 - Welding/Cutting/Burning
Impact/thermal	Thermal burns/high pressure impaction/heat stress	☐	FLD37 - High Pressure Washers
Impaction/electrical	Smashing body parts/pinching/cuts/electrocution	☒	FLD38 - Hand and Power Tools
Poor visibility	Slips/trips/falls	☐	FLD39 – Illumination
Fire/explosion	Burns/impaction	☐	FLD40 - Storage Tank Removal/Decommissioning
Communications	Disruption of communications	☐	FLD41 - Std. Hand/Emergency Signals
Energy/release	Unexpected release of energy	☐	FLD42 - Lockout/Tagout
General field work	Insects, plants, animals, snakes, reptiles (Haz. Eval. Form 2)	☒	FLD43 - Biological Hazards
Providing first aid	HBV, HIV (Haz.Eval. Form 2)	☒	FLD44 - BBP for First Aid Providers
Handling infectious waste	HBV, HIV (Haz. Eval. Form 2)	☐	FLD45 - BBP for Infectious Waste
Lead contaminated sites	Lead poisoning	☐	FLD46 - Control of Exposure to Lead
Puncture/cuts	Cuts/dismemberment/gouges	☐	FLD47 – Clearing, Grubbing and Logging Operations
Not applicable	Not applicable	☐	FLD48 – OSHA Inspections
Drilling hazards	Electrocution/overhead hazards/pinch points	☐	2.5 - Drilling Safety Guide

TASK-BY-TASK RISK ASSESSMENT-FORM 8
(COMPLETE ONE SHEET FOR EACH TASK)

TASK DESCRIPTION

TASK 1 – Gamma Scanning
TASK 2 – Subsurface Data Logging
TASK 3 – Soil Sampling

EQUIPMENT REQUIRED/USED
(Be specific, e.g., hand tools, heavy equipment, instruments, PPE)

Hard hat/Helmet	First Aid Kit	Hand Auger/Trowel/Shovel
Safety Boots	Paper Towels	Ludlum Model 44-20
Protective Glasses	Sample Containers	Ludlum Model 2241
Nitrile Surgical Gloves	Ziploc Bags	
All-Terrain Vehicle	Plastic Liners	

POTENTIAL HAZARDS/RISKS

Chemical

☒ Hazard Present Risk Level: ☐ H ☐ M ☒ L

What justifies risk level? Potential risk of exposure to Ra-226. No respiratory hazard anticipated. Use of nitrile gloves and good housekeeping protocols will minimize ingestion or inhalation of contaminated soil.

Physical

☒ Hazard Present Risk Level: ☐ H ☒ M ☐ L

What justifies risk level? Potential hazards include operating an all-terrain vehicle (ATV) and tripping/falling. An experienced member will operate the ATV and comply with safety practices (e.g. proper PPE, identify possible hazards). Maintaining focus on footing will minimize tripping/falling hazards.

Biological

☒ Hazard Present Risk Level: ☐ H ☐ M ☒ L

What justifies risk level? Insects, such as spiders, may be present at work locations. Use of gloves and general awareness will be implemented.

RADIOLOGICAL

☒ Hazard Present Risk Level: ☐ H ☐ M ☒ L

What justifies risk level? Dosage exposure will be kept to a minimum. Also, Given the time of year and work location, sun exposure is expected. Use of sunscreen and consumption of fluids will be implemented during field activities.

LEVELS OF PROTECTION/JUSTIFICATION

Level D; no inhalation pathway hazards are known or suspected.

SAFETY PROCEDURES REQUIRED AND/OR FIELD OPS UTILIZED

All field activities will be performed in accordance with this HASP and WESTON's standard operating procedures outlined in WESTON's Safety Officer Field Manual.

FLD01, FLD02, FLD 05, FLD10, FLD11, FLD12, FLD22, FLD34, FLD38, FLD43, FLD44

PERSONNEL PROTECTION PLAN-FORM 9 (REVISED 02/1998)

Engineering Controls
Describe Engineering Controls used as part of Personnel Protection Plan:

Task(s)
1-3 Level D Personal Protection Equipment

Administrative Controls
Describe Administrative Controls used as part of Personnel Protection Plan:

Task(s)
1-3 An initial health and safety tailgate meeting will be held at the site before work commences. Work will be completed in accordance with this HASP under the supervision/guidance of the SHSC.

Personal Protective Equipment
Action Levels for Changing Levels of Protection. Refer to HASP Form 13, Site AirMonitoring Program—Action Levels. Define Action Levels for up or down grade for each task:

Task(s)
1-3 Level D. Persistent dust that does not dissipate- stop work.

DESCRIPTION OF LEVELS OF PROTECTION

Level D		Level D Modified
Task(s): All		**Task(s): All**
☒ Head	Hard Hat	☐ Head
☒ Eye and Face	Safety glasses	☐ Eye and Face
☒ Hearing	Earplugs as necessary	☐ Hearing
☐ Arms and Legs Only		☐ Arms and Legs Only
☒ Appropriate Work Uniform	Coveralls, or appropriate clothing	☐ Whole Body
☒ Hand - Gloves	Nitrile	☐ Apron
☒ Foot - Safety Boots	Steel Toe	☐ Hand - Gloves
☐ Fall Protection		☐ Gloves
☐ Flotation		☐ Foot - Safety Boots
☐ Other		☐ Over Boots

DESCRIPTION OF LEVELS OF PROTECTION-FORM 10	
Level C	**Level B**
Task(s): All	**Task(s):**
☐ Head	☐ Head
☐ Eye and Face	☐ Eye and Face
☐ Hearing	☐ Hearing
☐ Arms and Legs Only	☐ Arms and Legs Only
☐ Whole Body	☐ Whole Body
☐ Apron	☐ Apron
☐ Hand - Gloves	☐ Hand - Gloves
☐ Gloves	☐ Gloves
☐ Gloves	☐ Gloves
☐ Foot - Safety Boots	☐ Foot - Safety Boots
☐ Outer Boots	☐ Outer Boots
☐ Boots (Other)	☐ Boots (Other)
☐ Half Face	☐ SAR - Airline
☐ Cart./Canister	☐ SCBA
☐ Full Face	☐ Comb. Airline/SCBA
☐ Cart./Canister	☐ Cascade System
☐ PAPR	☐ Compressor
☐ Cart./Canister	☐ Fall Protection
☐ Type C	☐ Flotation
☐ Fall Protection	☐ Other
☐ Flotation	
☐ Other	

SITE OR PROJECT HAZARD MONITORING PROGRAM-FORM 11

Air Monitoring Instruments

Instrument Selection and Initial Check Record

Reporting Format: ☒ Field Notebook ☐ Field Data Sheets* ☐ Air Monitoring Log ☐ Trip Report ☒ Other

Instrument	Task No.(s)	Number Required	Number Received	Checked Upon Receipt	Comment	Initials
☐ CGI				☐		
☐ O_2				☐		
☐ CGI/O_2				☐		
☐ CGI/O_2/tox-PPM, H_2S,H_2S/CO				☐		
☒ RAD				☐		
☒ GM (Pancake)	All			☐		
☐ NaI (Micro R)				☐		
☐ ZnS (Alpha Scintillator)				☐		
☐ Other ______				☐		
☐ PID				☐		
☐ HNu 10.2				☐		
☐ HNu 11.7				☐		
☐ Photovac, TMA				☐		
☐ OVM				☐		
☐ Other ______				☐		
☐ FID				☐		
☐ Fox 128				☐		
☐ Heath, AID, Other				☐		
☐ RAM, Mini-RAM, Other ______				☐		
☐ Monitor				☐		
Specify: _____				☐		
☐ Personal Sampling				☐		
Specify: _____				☐		
☐ Bio-Aerosol Monitor				☐		
☐ Pump - MSA, Dräeger, Sensidyne				☐		
☐ Tubes/type: ______				☐		
☐ Tubes/type: _____				☐		
☐ Other ______				☐		

*Refer to Attachment E.

SITE OR PROJECT HAZARD MONITORING PROGRAM-FORM 12

Air Monitoring Instruments Calibration Record

Instrument, Mfg., Model, Equip. ID No.	Date	Time	Calib. Material	Calib. Method Mfg.'s	Other	Initial Setting and Reading	Final Setting and Reading	Calibrator's Initials

SITE AIR MONITORING PROGRAM-FORM 13				
Action Levels				
These Action Levels, if not defined by regulation, are some percent (usually 50%) of the applicable PEL/TLV/REL. That number must also be adjusted to account for instrument response factors.				
	Tasks	**Action Level**		**Action**
☐ **Explosive atmosphere**		Ambient Air Concentration	Confined Space Concentration	
		<10% LEL	0 to 1% LEL	Work may continue. Consider toxicity potential.
		10 to 25% LEL	1 to 10% LEL	Work may continue. Increase monitoring frequency.
		>25% LEL	>10% LEL	Work must stop. Ventilate area before returning.
☐ **Oxygen**		Ambient Air Concentration	Confined Space Concentration	
		<19.5% O_2	<19.5% O_2	Leave area. Re-enter only with self-contained breathing apparatus.
		19.5% to 25% O_2	19.5% to 23.5% O_2	Work may continue. Investigate changes from 21%.
		>25% O_2	>23.5% O_2	Work must stop. Ventilate area before returning.
☒ **Radiation**	1-3	< 3 times background		Continue work.
		3 times background to < 1 mR/hour		Radiation above background levels (normally 0.01-0.02 mR/hr) signifies possible radiation source(s) present. Continue investigation with caution. Perform thorough monitoring. Consult with a Health Physicist.
	1-3	> 1 mrem/hour		Potential radiation hazard. Evacuate site. Continue investigation only upon the advice of Health Physicist.
☐ **Organic gases and vapors**		PID readings in breathing zone (BZ) ≤ 1 ppm unit above background.		Continue working in Level D.
		PID readings in BZ consistently > 50 ppm unit above background that do not dissipate.		Cease work.
		Although PID readings greater than 50 ppm are not anticipated, the breathing zone action guidance document will be implemented if PID detects over 50 ppm.		
☒ **Inorganic gases, vapors, and particulates**	1	Negligible visible dust.		Continue working in Level D.
		Visible dust that does not dissipate.		Cease work.

CONTINGENCIES-FORM 14

Emergency Contacts and Phone Numbers		
Agency	Contact	Phone Number
Local Medical Emergency Facility (LMF)	Cibola General Hospital	(505) 287-5230
WESTON Medical Emergency Contact	Dr. Peter Greaney	(800) 455-6155
WESTON Health and Safety	Corporate Health and Safety	(505) 837-6566
Fire Department	911	911
Police Department	911	911
On-Site Coordinator- SHSC	Alex Grubb	(415) 928-9777
Client Site Contact	Randy Nattis	(415) 940-1108
Site Telephone or Nearest Telephone	Alex Grubb	(415) 928-9777

Local Medical Emergency Facility(s)		
Name of Hospital: Cibola General Hospital		
Address: 1016 Roosevelt Avenue, Grants, New Mexico 87020		**Phone No:** (505) 287-5230
Name of Contact: Emergency Room		**Phone No:** 911
Type of Service: ☐ Physical trauma only ☐ Chemical exposure only ☒ Physical trauma and chemical exposure ☒ Available 24 hours	**Route to Hospital (written detail):** Head west on Co Road 23 toward Little Mountain Road, Turn Left onto NM-122E, Turn Right onto NM-606, Make a slight Left to merge onto I-40E, Take exit 81B toward I-40/Grants, Merge onto NM-122 W/NM-53E, Turn Right onto Historic U.S. 66, Turn Left onto 1st Street, Turn Right onto W Roosevelt Avenue, Turn Left onto Cordova Court, Emergency Room is on the Left.	**Travel time from site:** Approximately 34 minutes **Distance to hospital:** Approximately 24.2 miles **Name/no. of 24-hr ambulance service:** **911 /**

Figure 1—Route to Hospital (Map)-Form 15

A Co Rd 23
B Cibola General Hospital: Vitale Karla S DO, C

Add Destination - Show options

GET DIRECTIONS

Suggested routes

NM-122 E and I-40 E	**24.2 mi, 34 mins**
NM-122 E/Historic U.S. 66	23.2 mi, 35 mins

Driving directions to Cibola General Hospital: Vitale Karla S DO

A **Co Rd 23**

1. Head **west** on **Co Rd 23** toward **Little Mountain Rd** — 4.2 mi
2. Turn left onto **NM-122 E** — 6.4 mi
3. Turn right onto **NM-606** — 0.2 mi
4. Continue onto **NM-606** — 0.1 mi
5. Slight left to merge onto **I-40 E** — 9.7 mi
6. Take exit **81B** toward **I-40/Grants** — 0.3 mi
7. Merge onto **NM-122 W/NM-53 E** — 0.5 mi
8. Turn right onto **Historic U.S. 66** — 1.4 mi
9. Turn left onto **1st St** — 0.9 mi
10. Turn right onto **W Roosevelt Ave**
Destination will be on the left — 0.7 mi

B **Cibola General Hospital: Vitale Karla S DO**
1016 Roosevelt Ave
Grants, NM 87020

CONTINGENCIES-FORM 16

Response Plans

Medical - General	First Aid Kit:	Type	Location	Special First-Aid Procedures:
Provide first aid, if trained; assess and determine need for further medical assistance. Transport, or arrange for transport, after appropriate decontamination.	(1) 5 man	General field first aid kit	WESTON field vehicle	Cyanides on-site ☐ Yes ☒ No If yes, contact LMF. Do they have antidote kit? ☒ Yes ☐ No
	Eyewash required ☒ Yes ☐ No	Type 15 min Portable Kit	Location WESTSON field vehicle	**HF** on-site ☐ Yes ☒ No If yes, need neutralizing ointment for first-aid kit. Contact LMF.
	Shower required ☐ Yes ☒ No	Type	Location	

Plan for Response to Spill/Release		**Plan for Response to Fire/Explosion**		**Fire Extinguishers ABC**
In the event of a spill or release, ensure safety, assess situation, and perform containment and control measures, as appropriate.	a. Cleanup per MSDSs if small; or sound alarm, call for assistance, notify Emergency Coordinator b. Evacuate to pre-determined safe place c. Account for personnel d. Determine if team can respond safely e. Mobilize per Site Spill Response Plan	In the event of a fire or explosion, ensure personal safety, assess situation, and perform containment and control measures, as appropriate:	a. Call for assistance and notify Emergency Coordinator b. Evacuate to predetermined safe place c. Account for personnel d. Use fire extinguisher only if safe and trained in its use e. Stand by to inform emergency responders of materials and conditions	Type/Location ABC/WESTON field vehicle / / / / /

Description of Spill Response Gear	Location	Description (Other Fire Response Equipment)	Location

Plan to Respond to Security Problems

Local police shall be contacted in the event of a security problem- Dial 911.

DECONTAMINATION PLAN-FORM 17

Personnel Decontamination

Consistent with the levels of protection required, step-by-step procedures for personnel decontamination for each level of protection are attached.

Levels of Protection Required for Decontamination Personnel

The levels of protection required for personnel assisting with decontamination will be:

☐ Level B ☐ Level C ☒ Level D

Modifications include: None

Disposition of Decontamination Wastes

Used PPE and disposable sampling equipment will be bagged in plastic trash bags and disposed of as municipal trash.

Decontamination fluids and rinse-water generated during sampling will consist of dilute isopropanol/methanol, deionized water, residual contaminants, and water with non-phosphate detergent. The small quantity of liquids will be allowed to evaporate on site.

Equipment Decontamination

Sampling Equipment Decontamination

Sampling equipment will be decontaminated in accordance with the following procedure:

If non-dedicated sampling equipment is used, it will be washed in a tub with a mixture of potable water and non-phosphate detergent and scrubbed with brushes; rinsed three times with deionized water, and allowed to air dry between sample locations.

LEVEL D/MODIFIED LEVEL D DECONTAMINATION PLAN-FORM 18	
Check indicated functions or add steps, as necessary:	
Function	**Description of Process, Solution, and Container**
☒ Segregated equipment drop	Plastic sheeting and/or clean with a damp towel.
☐ Boot cover and glovewash	
☐ Boot cover and glove rinse	
☐ Tape removal - outer glove and boot	
☒ Boot cover removal	
☒ Outer glove removal	Remove inside-out. Double-bag for disposal.
HOTLINE	
☐ Suit/safety boot wash	
☐ Suit/boot/glove rinse	
☐ Safety boot removal	
☐ Suit removal	
☐ Inner glove wash	
☐ Inner glove rinse	
☐ Inner glove removal	
☐ Inner clothing removal	
CONTAMINATION REDUCTION ZONE (CRZ)/SAFE ZONE BOUNDARY	
☐ Field wash	
☐ Redress	

Disposal Plan, End of Day:
All waste will be double-bagged in plastic trash bags.

Disposal Plan, End of Week:
All waste will be double-bagged in plastic trash bags.

Disposal Plan, End of Project:
All waste, unless grossly contaminated, will be disposed of at a municipal landfill.

SITE PERSONNEL AND CERTIFICATION STATUS-FORM 21

WESTON	
Name: Alex Grubb **Title: Project Manager, SHSC** **Task(s): All** **Certification Level or Description:** ☒Medical Current ☒Training Current ☐Fit Test Current (Qual.) ☐Fit Test Current (Quant.)	**Name: Ian Bruce** **Title: Data Manager** **Task(s): All** **Certification Level or Description:** ☒Medical Current ☒Training Current ☐Fit Test Current (Qual.) ☐Fit Test Current (Quant.)
Name: Tom Fortner **Title: Field Manager** **Task(s): All** **Certification Level or Description:** ☒Medical Current ☒Medical Current ☐Fit Test Current (Qual.) ☐Fit Test Current (Qual.)	**Name: Tommy Evans** **Title: Field Scientist** **Task(s): All** **Certification Level or Description:** ☐Medical Current ☐Training Current ☐Fit Test Current (Qual.) ☐Fit Test Current (Quant.)
Name: **Title:** **Task(s):** **Certification Level or Description:** ☐Medical Current ☐Training Current ☐Fit Test Current (Qual.) ☐Fit Test Current (Quant.)	**Name:** **Title:** **Task(s):** **Certification Level or Description:** ☐Medical Current ☐Training Current ☐Fit Test Current (Qual.) ☐Fit Test Current (Quant.)
Name: **Title:** **Task(s):** **Certification Level or Description:** ☐Medical Current ☐Training Current ☐Fit Test Current (Qual.) ☐Fit Test Current (Quant.)	**Name:** **Title:** **Task(s):** **Certification Level or Description:** ☐Medical Current ☐Training Current ☐Fit Test Current (Qual.) ☐Fit Test Current (Quant.)
Name: **Title:** **Task(s):** **Certification Level or Description:** ☐Medical Current ☐Training Current ☐Fit Test Current (Qual.) ☐Fit Test Current (Quant.)	**Name:** **Title:** **Task(s):** **Certification Level or Description:** ☐Medical Current ☐Training Current ☐Fit Test Current (Qual.) ☐Fit Test Current (Quant.)
Name: **Title:** **Task(s):** **Certification Level or Description:** ☐Medical Current ☐Training Current ☐Fit Test Current (Qual.) ☐Fit Test Current (Quant.)	**Name:** **Title:** **Task(s):** **Certification Level or Description:** ☐Medical Current ☐Training Current ☐Fit Test Current (Qual.) ☐Fit Test Current (Quant.)

TRAINING CURRENT - Training: All personnel, including visitors, entering the exclusion or contamination reduction zones must have certification s of completion of training in accordance with OSHA 29 CFR 1910, 29 CFR 1926, or 29 CFR 1910.120.

FIT TEST CURRENT - Respirator Fit Testing: All persons, including visitors, entering any area requiring the use or potential use of any negativ e pressure respirator must have had, as a minimum, a qualitative fit test, administered in accordance with OSHA 29 CFR 1910.134 or ANSI, within the last 12 months. If site conditions require the use of a full -face, negative-pressure, air-purifying respirator for protection from asbestos or lead, employees must have had a qualitative fit test, administered according to OSHA 29 CFR 1910.1001 or 1025/1926, within the last 6 months.

MEDICAL CURRENT - Medical Monitoring Requirements: All personnel, including visitors, entering t he exclusion or contamination reduction zones must be certified as medically fit to work and to wear a respirator, if appropriate, in accordance with 29 CFR 1910, 29 CFR 1 926/1910, or 29 CFR 1910.120.

The Site Health and Safety Coordinator is responsible for verifying all certifications and fit tests.

HEALTH AND SAFETY PLAN APPROVAL/SIGNOFF FORM-FORM 23	
Site Name: Haystack Mine No. 1	**WO#:** 20409.012.002.0009.00
Navajo Nation, Haystack Chapter, McKinley County, New Mexico	
I understand, agree to, and will conform with the information set forth in this Health and Safety Plan (and attachments) and discussed in the personnel health and safety briefing(s).	

Name	Signature	Date

TRAINING AND BRIEFING TOPICS-FORM 24	
The following items will be covered at the site-specific training meeting, daily or periodically.	
☒ Site characterization and analysis, Sec. 3.0, 29 CFR 1910.120 I	☐ Level A
☒ Physical hazards, HASP Form 07	☐ Level B
☒ Chemical hazards, HASP Form 04	☐ Level C
☒ Animal bites, stings, and poisonous plants	☒ Level D
☐ Etiologic (infectious) agents	☐ Monitoring, 29 CFR 1910.120 (h)
☐ Site control, 29 CFR 1910.120 d	☒ Decontamination, 29 CFR 1910.120 (k)
☒ Engineering controls and work practices, 29CFR 1910.120 (g)	☐ Emergency response, 29 CFR 1910.120 (l)
☒ Heavy machinery	☐ Elements of an emergency response, 29CFR 1910.120 (l)
☐ Forklift	☒ Procedures for handling site emergency incidents, 29 CFR 1910.120 (l)
☐ Backhoe	☐ Off-site emergency response, 29 CFR 1910.120 (l)
☒ Equipment	☐ Handling drums and containers, 29 CFR 1910.120 (j)
☐ Tools	☐ Opening drums and containers
☐ Ladder, 29 CFR 1910.27 (d)/29 CFR 1926	☐ Electrical material handling equipment
☐ Overhead and underground utilities	☒ Radioactive waste
☐ Scaffolds	☐ Shock-sensitive waste
☐ Structural integrity	☐ Laboratory waste packs
☐ Unguarded openings- wall, floor, ceilings	☐ Sampling drums and containers
☐ Pressurized air cylinders	☐ Shipping and transport, 49 CFR 172.101, IATA
☒ Personal protective equipment, 29 CFR 1910.120 (g); 29 CFR 1910.134	☐ Tank and vault procedures
☐ Respiratory protection, 29 CFR 1910.120 (g); ANSI Z88.2	☐ Illumination, 29 CFR 1910120 (m)
☐ Drilling Safety	☐ Sanitation, 29 CFR 1910.120 (n)
☐	☐
☐	☐
☐	☐

	Weston Solutions, Inc.	Doc No:	FLD01-0313
		Initial Issue Date	March 2013
		Revision Date:	Initial Version
Occupational Noise and Hearing Conservation		Revision No.	0
		Next Revision Date:	Annual Review
Preparation: CEHS	Authority: CEHS Director	Issuing Dept: CEHS	Page: Page 1 of 7

Purpose

The purpose of this program is to provide a process to minimize employee-hearing loss caused by excessive occupational exposure to noise.

Scope

This program is applicable to all employees who may be exposed to noise in excess of 85 decibels (decibels). When work is performed on a non-Weston owned or controlled site, the Owner or controlling entity's program takes precedence, however, this document covers Weston Solutions employees and contractors and is used on Weston owned or controlled premises, or when an owner or controlling entity's program doesn't exist or is less stringent.

Definitions

Audiometric testing - means detection by the person being tested of a series of pure tones. For each tone, the person indicates the lowest level of intensity that they are able to perceive.

Decibels – means the sound energy measured by a sound level meter using the "A" scale. The "A" scale is electronically weighted to simulate the response of the human ear to high and low frequency noise.

Slow Response – means the setting on the sound level meter that averages out impulses of brief duration that would cause wide fluctuation in the sound level meter reading.

Standard Threshold Shift – means a change in hearing threshold relative to the baseline audiogram of an average of 10 dB (corrected for age) at 2000, 3000 and 4000 Hz in either ear.

Key Responsibilities

Managers and Supervisors

- Ensure requirements of this program are established and maintained.
- Ensure employees are trained and comply with the requirements of this program.

Employees

- Wear hearing protection when required, attend the training, and cooperate with testing and surveying/sampling.

Procedure

Occupational hearing loss is a cumulative result of repeated or continued absorption of sound energy by the ear; employee protection is based on reduction of the noise level at the ear or limiting the employee's exposure time. Weston Solutions shall offer hearing protection to all employees exposed to potential high noise levels in working areas and to those employees requesting hearing protection.

Hearing Conservation Program

Weston Solutions administers a continuing effective hearing conservation program when employees, who work in areas where the exposure to noise levels are 85 decibels or greater for the 8 hour time-weighted average. Engineering controls or administrative controls will be implemented as feasible however if these measures are infeasible or unsuccessful in reducing exposure below 85 dBA as an 8 hour TWA employees will be provided with and required to wear hearing protection. A monitoring or survey program as described below is used to identify employees to be included in the hearing conservation program. Employees will wear hearing protection in signed areas while on an owner or non-Weston controlled facility or site.

Noise Exposure Survey

All work areas that are suspected of having noise levels exceeding 85 decibels are surveyed.

Noise exposure surveys will be conducted by a qualified employee or Field Safety Officer. Survey strategies are designed to identify noise sources to be considered for engineering controls, areas to be designated as Hearing Protection Required zones, employees for inclusion in the hearing conservation program and to enable the proper selection of hearing protectors.

Where circumstances such as high worker mobility, significant variations in sound level, or a significant component of impulse noise make area monitoring generally inappropriate, representative personal sampling described below will be used it can be shown that area sampling produces equivalent results.

<u>Exposure Surveys:</u>

- A representative sampling of employees will be conducted to determine the exposure to noise over a period of time.
- Noise dosimeters must be capable of integrating all continuous, intermittent and impulsive sound levels from 80 dB to 130 dB and must be calibrated so a dose of 50% corresponds to a time weighted average of 85 dB.

To evaluate noise exposure in terms of possible hearing damage, it is necessary to know the overall sound level ("A" scale measurement), the exposure time of the individual in hours per day and the length of time the individual has worked in the area being surveyed. This data is supplemented by the following:

- Name of area and location
- Date and time of survey
- Name of person conducting survey
- Description of instrument used, model and serial number
- Environmental conditions
- Description of people exposed

Weston Solutions shall notify each employee of their monitoring results.

A plot of noise levels must be made for owned facilities. The plot must be filed or posted at the facility.

Weston Solutions evaluates hearing protector attenuation for the specific noise environments in which the protector will be used. The adequacy of hearing PPE is reevaluated whenever noise exposures change and PPE is adjusted where necessary.

All sound measuring equipment must be calibrated before and after each survey. Records of sound measuring equipment calibration and noise level surveys are kept for 20 years.

Noise Surveys are repeated whenever changes in the workplace may change exposure levels and if controls are not feasible; hearing protection being used by employees will be changed if necessary to reduce the noise exposure to a level below 85 decibels.

NOISE CONTROL METHODS

Engineering Controls

The primary means of reducing or eliminating personnel exposure to noise is through engineering controls. Engineering controls are defined as any modification or replacement of equipment, or related physical change at the noise source or along the sound tr ansmission path that will reduce the noise level to the employee's ear. Engineering controls include items such as; mufflers on heavy equipment or motors, sound baffles, and enclosures.

Administrative Controls

Administrative controls may include changes in the work schedule or operations to reduce noise exposure, increasing worker distance from the noise source, and rotation of jobs to reduce time limits of exposure. Administrative time control is not a preferable method for preventing noise exposure since extreme noise for a short duration can cause severe, permanent hearing loss. Administrative controls may be utilized in accordance with the TLV Table ACGIH TLVs and Biological Exposure Indices (BEIs), 2007 Edition. Administrative controls may not be utilized for exposures greater than 100 dBA, regardless of the exposure time.

Hearing Protection (Devices)

Hearing protection devices are utilized whenever engineering controls prove to be infeasible or cost prohibitive. Various types of ear muffs and ear plugs are available. Hearing protector attenuation is intended to reduce employee exposures below 80 dBA for employees with standard threshold shifts and below 85 dBA for all other employees. WESTON personnel and WESTON subcontractors must wear hearing protection devices (HPDs) when required and where signs are posted requiring their use. Hearing protection devices are strongly recommended in any noisy environment, but are mandatory in the following situations:

- The 8-hour average may equal or exceed 85 dBs.
- Any employee exposed to greater than or equal to 85 dBs and who have experienced a standard threshold shift in their hearing.
- Any noise equal to greater than 100 dBs impact, continuous or intermittent.
- Anywhere a "HEARING PROTECTION REQUIRED" sign is pos ted. These signs are to be posted in all mandatory situations listed above.

In addition when noise levels equal or exceed 80 dBA employees must have:

- Availability of hearing protectors.
- Information and training on effects of noise.
- Availability of audiometric testing where there is a risk to health.

Not all hearing protection devices have the same noise reduction rating (NRR). Verification of all NRR values must be made by referring to the manufacturers' specifications. The proper hearing protection is selected using results from a properly calibrated sound level meter in accordance with ACGIH TLVs and BEIs, 2007 Edition.

Additional information regarding the selection, use, maintenance, and control of hearing protection devices is provided in the WESTON Personal Protective Equipment Program (Section 5.0).

NRR will be adjusted using the following to estimate the attenuation afforded to a noise-exposed employee in a work environment by muffs, plugs, or a combination of both:

Single Protection

A common formula used to estimate exposure for single protection (either muffs or plugs) follows:

1. Determine the laboratory-based noise attenuation provided by the HPD. This is referred to as the NRR and is listed on the packaging.

2. Subtract the NRR from the C-weighted TWA workplace noise level, as follows:

Estimated Exposure (dBA) = TWA (dBC) - NRR

If C-weighted noise level data are not available, A-weighted data can be used by subtracting a 7 dB correction factor from the NRR, as follows:

Estimated Exposure (dBA) = TWA (dBA) - (NRR - 7)

Example:

TWA=100 dBA, muff NRR=19 dB

Estimated Exposure = 100 - (19-7) = 88 dBA

Dual Protection

A common formula used to estimate exposure for dual protection (ear muffs and plugs are used simultaneously) follows:

1. Determine the laboratory-based NRR for the higher rated protector (NRRh).

2. Subtract 7 dB from NRRh if using A-weighted sound level data.

3. Add 5 dB to the field-adjusted NRR to account for the use of the second hearing protector.

4. Subtract the remainder from the TWA as follows:

Estimated Exposure (dBA) = TWA (dBC) - (NRRh + 5) or

Estimated Exposure (dBA) = TWA (dBA) - [(NRRh- 7) + 5]

Example:

TWA=110 dBA, plug NRR=29, and muff NRR=25 dB

Estimated Exposure = 110 - [(29 - 7) + 5] = 83 dBASignage
Clearly worded signs should be posted at entrances to, or on the periphery of, areas where employees may be exposed to noise levels in excess of 85 decibels. These signs describe the hazards involved and the required protective actions.

MEDICAL SURVEILLANCE

Compliance with the HCP is required when an employee's exposure to noise is in excess of 85 dBA. Employees who work with drill rigs, heavy construction equipment, or noisy client operations are candidates for the HCP and medical surveillance requirements thereof. Supervisors of any employees who do not meet these categories but who work around excessive noise (e.g., treatment plant operations, print shop, maintenance personnel) must perform noise surveys to determine the need for those employees to participate in the HCP, and advise the safety officer who will notify the OMP.

WESTON's OMP will make the final determination of employee involvement in the medical surveillance component of the HCP. Audiometric testing is performed annually to evaluate the hearing of all individuals who are routinely exposed to 8-hour TWA exposures of 85 dBA or greater (including compliance with the "arms -length rule"). WESTON's OMP is responsible for assuring local clinic compliance with the audi ometric testing component of the standard.

Audiometric Testing

Weston Solutions has establish ed and maintains an audiometric testing program by making audiometric testing available to all employees whose exposure to noise 85 decibels (8 hr TWA) or greater and employees are provided an audiometric evaluation annually as part of the Wellness Program element of HAZWOPER medical examinations. The program is provided at no cost to employees.

- Weston Solutions audiometric program establishes a valid baseline audiogram against which future audiograms can be compared. An employee must receive a baseline audiogram within six months of their first exposure to 85 decibels or greater for an eight hour period.
- When a mobile van is used the baseline is established within one year.
- An employee receive s an audiometric evaluation following every year they work in a position that is exposed to noise at 85 decibels or greater.
- A qualified third party performs all audiometric testing, evaluation, reporting and retesting.
- Audiometric testing is preceded by a period of at le ast 14 hours during which there is no exposure to workplace sound levels in excess of 80 decibels. This requirement may be met by the use of hearing protectors that reduce the employee noise ex posure level below 80 decibels and employees shall also be notified to avoid high levels of noise.
- An otoscopic exam is required before an audiogram is initiated. A qualified person examines the ear canal for any ear infections or canal irregularities that might affect the audiogram or rule out the use of earplugs.

At least annually after obtaining the baseline audiogram, Weston Solutions obtains a new audiogram for each employee exposed at or above an 8-hour time-weighted average of 85 decibels. Annual audiograms shall be evaluated as follows:

- Each audiogram is compared to the employees' baseline audiogram to ensure the test was valid and to determine if a standard threshold shift has occurred.
- If a comparison of the annual audiogram to the baseline audiogram indicates a standard threshold shift, the employee is informed of this fact in writing, within 21 days of the determination.
- If a standard threshold shift is determined, the employee will be retested within 30 days.
- The retest results will be considered as the annual audiogram.
- Employees are informed of their audiometric test results in writing within 21 days of determination.
- If the employee has sustained a standard threshold shift, after retesting, that employee is retrained and refitted for appropriate hearing protection.
- The employee is referred for additional medical evaluation if indicated.

Records

Weston Solutions maintains accurate record of all employee exposure measurements and ensures that all records are maintained as required by 29 CFR 1910.95 (Occupational Noise Exposure).

Employee audiograms are considered medical/exposure records. These records are kept for the length of employment plus 30 years.

TRAINING

A training program has been instituted for all employees who are exposed to a noise action level or work in high noise areas. Noise awareness training for employees is provided before initial assignment and on an annual basis. The training addresses the effect of noise on hearing; the purpose of hearing protectors, including the advantages, disadvantages and alternatives of various types, and includes instructions on selection, fitting, use and care of hearing protectors and the purpose of audiometric testing as well as an explanation of test procedures.

Training is updated to be consistent with changes in the work process , PPE requirements and the proper techniques of wearing hearing protection.

All staff maintain real-time access to this program though the CEHS Web Portal , which includes noise exposure procedures. In accordance with client requirements, the program may be posted in a designated location at the worksite. A copy of the program is provided for review by all employees, their representatives and regulatory agencies (Assistant Secretary for OSHA and the Director will have access to all records).

All training is documented in EHS Track.

FLD 02 INCLEMENT WEATHER

Hot weather (ambient temperatures over 70°F), cold weather (ambient temperatures below 40°F), rain, snow, ice, and lightning are examples of inclement weather that may be hazardous or add risk to work activities. Extremes of heat, cold, and humidity, as well as rain, snow, and ice, can adversely affect monitoring instrument response and reliability, respiratory protection performance, and chemical protective clothing materials.

RELATED FLDs AND OP

FLD 05 – Heat Stress Prevention and Monitoring
FLD 06 – Cold Stress
OP 05-03-008 – Inclement Weather & Business Disruption Policy

PROCEDURE

The potential for exacerbating the impact of physical hazards must be considered for tasks that expose personnel to inclement weather. Risk assessment and hazards analysis should be accomplished during the planning stages of a project for the most likely inclement weather conditions that may be encountered, i.e., rain and lightning in late spring, summer, and early fall, or lightning prone areas; cold, snow, and ice in winter. The Field Safety Officer (FSO) must determine the proper safety procedures and recommend them to the site manager. Each worker must evaluate the risk associated with his/her work and be actively alert to these hazards. Managers and workers must be familiar with the requirements of FLD 05 and FLD 06.

A pre-site activity risk assessment must be completed when inclement weather occurs. Weather conditions that affect instruments and personal protective equipment (PPE) function must be conveyed to site workers who should monitor function and integrity of PPE and be alert to changing weather conditions. A decision must be made on the proper safety procedures to use if work must continue, or to stop work if the risk is too great. The appropriate Safety Professional **must be notified of all instances of the need to stop work for safety reasons, including inclement weather**.

Heat

Hot, dry weather increases risk of soil drying, erosion, and dust dispersion, which may present or increase risk of exposure and environmental impact from toxic hazards. Hot weather will increase pressure on closed containers and the rate of volatilization, thereby potentially increasing the risk of exposure to toxic, flammable, or explosive atmospheres.

<u>Prevention and Protective Measures</u>

Employees must be protected from airborne contaminants using engineering controls such as wetting dry soil to prevent particle dispersion, and providing local ventilation to reduce volatile air contaminants to safe levels, or if engineering controls are infeasible, using prescribed PPE. Wind shifts and velocity should be measured where change may result in dispersion of airborne contaminants into the work area.

Rain, Wet Weather, and High Humidity

Wet conditions resulting from rain and wet weather increase slipping and tripping hazards, braking distances of vehicles, the potential for vehicle skidding, or difficulties in handling powered devices such as augers and drills. Rain fills holes, obscures trip and fall hazards, and increases risk of electrical shock when working with electrical equipment. Changes in soil conditions caused by rain can impact trenching and excavating activities, creating the potential for quicksand formation, wall collapse, and cave-in. Vehicles become stuck in mud, and tools and personnel can slip on wet surfaces. Rain and wet conditions may decrease visibility (especially for personnel wearing respiratory protection) and limit the effectiveness of certain direct-reading instruments (e.g., photoionization detectors [PIDs]).

Feet that become wet and are allowed to remain wet can lead to serious problems under both heat and cold conditions. Activities that may result in wet feet include extended work in chemical protective clothing and wading in water/liquid during biological assessments. Trench foot, paddy foot, and immersion foot are terms associated with foot ailments resulting from feet being wet for long periods of time. All have similar symptoms and effects. Initial symptoms include edema (swelling), tingling, itching, and severe pain. These may be followed by more severe symptoms including blistering, death of skin tissue, and ulceration. (NOTE: The following Preventive and Protective Measures also apply to Cold, Snow, and Ice.)

Preventive and Protective Measures

Walkways, stairs, ladders, elevated workplaces, and scaffold platforms must be kept free of mud, ice, and snow. Employees shall be prohibited from working on scaffolds covered with snow, ice, or other slippery material except as necessary for removal of such materials.

Vehicles used in rain or cold weather must have working windshield wipers and defrosters, and windows must be kept clear of obstruction.

Drivers must observe traffic laws, including maintaining speed within limits safe for weather conditions, and wearing seat belts at all times. Note that this may mean operating below the posted speed limit.

When walking, workers should use a walking stick or probe to test footing ahead where there is standing water, snow, or ice to protect the walker against stepping into potholes or onto puncture hazards, buried containers, or other potential structurally unsound surfaces.

Prior to using vehicles or equipment in off-road work, workers should walk the work area or intended travelway when puddles or snow may obscure potholes, puncture hazards, or buried containers, or other potential structurally unsound surfaces.

Project managers should arrange to have winches, come-alongs, or other mechanical assistance available when vehicles are used in areas where there is increased risk of getting stuck. Cable or rope and mechanical equipment used for pulling stuck vehicles must be designed for the purpose, of sufficient capacity for the load, and be inspected regularly and before use to ensure safety. **Manually pushing stuck vehicles is to be avoided**.

Prevention methods are required when work is performed in wet conditions or when conditions result in sweating, causing the feet to become and remain wet. Proper hygiene is critical. Workers must dry their feet and change socks regularly to avoid conditions associated with wet feet. Use of foot talc or powder can additionally assist in prevention of this type of condition.

Cold, Snow, and Ice

Cold weather affects vehicle operation by increasing difficulty in starting and braking. Ice, frost, and snow can accumulate on windows and reduce vision. Cold, wet weather can cause icing of roadways, driveways, parking areas, general work places, ladders, stairs, and platforms. Ice is not always as obvious to see as snow or rain, and requires special attention, especially when driving or walking.

Snow and ice increase the risk of accidents such as slipping when walking, climbing steps and ladders, or working at elevation, and the risk of accidents when driving vehicles or operating heavy equipment. Heavy snow and ice storms may cause electric lines to sag or break, and the use of electrical equipment in snow increases the risk of electric shock. Snow can hide potholes and mud, which can result in vehicles getting stuck or persons falling when stepping into hidden holes. Snow also may cover water, drums or other containers, sharp metal objects, debris, or other objects that can cause falls or punctures.

Preventive and Protective Measures

WESTON personnel are cautioned against operating motor vehicles such as cars or trucks on ice under any circumstances. If traveling in icy conditions, WESTON personnel should follow all public service advisories that curtail driving activities.

Personnel performing activities that require working over ice should be aware of minimal ice thickness safety guidelines as follows:

- 4-inch minimum: activities such as walking or skating.
- 6-inch minimum: activities such as snowmobiling or the use of equipment with the same weight and cross-sectional area as a snowmobile.

Personnel should always be aware that these measurement guidelines are under ideal conditions and that snow cover, conditions on rivers, ponds, or lakes with active currents, and other environmental factors impact the safety of working on ice. Clear ice typically is the strongest, while ice that appears cloudy or honeycombed (contains entrained air) is not as structurally strong. Measurements made by drilling or cutting through the ice should be made every few feet to verify safe conditions. Provisions for rescue (e.g., ladders or long poles and effective communications) must be available at the work site.

Lightning

Lightning represents a hazard of electrical shock that is increased when working in flat open spaces, elevated work places, or near tall structures or equipment such as stacks, radio towers, and drill rigs. Lightning has caused chemical storage tank fires and grass or forest fires. Static charges associated with nearby electrical storms can increase risk of fire or explosion when working around flammable materials, and can adversely affect monitoring instruments.

Lightning is the most dangerous and frequently encountered weather hazard people experience each year. Lightning affects all regions. **Florida, Michigan, Pennsylvania, North Carolina, New York, Ohio, Texas, Tennessee, Georgia, and Colorado** have the most lightning deaths and injuries.

Preventive and Protective Measures

Prior to working in areas or beginning projects when or where there is an increased potential for lightning striking personnel, steps must be taken to predict the occurrence of lightning strikes. Recommendations include:

- Check with client management to determine if there are any patterns or noted conditions that can help predict lightning or if there are structures that are prone to lightning strikes. Arrange for client notification when there is increased potential for lightning activities. Ensure that clients include WESTON workers in lightning contingency plans.

- Monitor weather reports.
- Note weather changes and conditions that produce lightning.
- Stop work in open areas, around drill rigs or other structures that may attract lightning, on or in water and in elevated work places when lightning strikes are sighted or thunder is heard near a work site.
- Ensure all personnel are provided with safe areas of refuge. Prevent personnel from standing in open areas, under lone trees, or under drill rigs.
- Observe the "30-30" Rule. If you see lightning and thunder is heard within 30 seconds (approximately 6 miles), seek shelter. If you hear thunder, but did not see the lightning, you can assume that lightning is within 6 miles and you should seek shelter. Remain in the sheltered location for 30 minutes following the last lightning strike.
- Use a hand held static potential meter (lightning detection device) to monitor the potential difference between a cloud and the ground. When the measured potential is greater than 2 kV/m, there is a potential for a lightning strike – seek shelter.

High Wind and Tornado Safety

High Winds

Many construction workers have died due to wind-related accidents and injuries. A ladder that seems secure under normal circumstances can become unstable during windy conditions and cause you to fall. Scaffolding that is improperly secured can rip free during strong winds and kill bystanders. The risk of injury for construction workers increases during strong winds. Keep in mind that changing weather conditions can affect your daily work tasks, and make sure you have a game plan to prevent proper damage and personal injury.

Stay Informed: With today's modern technology available at the touch of a button, you should keep up to date with the latest local weather reports. Visit weatherbug.com or weather.gov to stay informed in case of wind warnings, watches, and advisories. Larger projects may have their own weather station on site to provide instant weather data. Use daily hazard assessments to determine if working conditions have changed or will change throughout the day.

Be Prepared: When you know the weather will be windy, secure loose building materials, scaffolding and fencing that could be picked up or torn loose by strong winds and thrown onto surrounding streets, structures, vehicles, or bystanders.

Know the Limits of Your Equipment: When operating any equipment, take time to read the operator's manual and become familiar with the wind specifications. Many crane manufacturers have high-wind guidelines to prevent you from operating a crane in unsafe weather. You should also check safety equipment such as fall protection to determine if it is adequate for windy conditions.

Know the Terminology

Severe Thunderstorm Watch

A Severe Thunderstorm Watch means that strong thunderstorms capable of producing winds of 58 mph or higher and/or hail 3/4 inches in diameter or larger are possible. If you are in the area of a Severe Thunderstorm Watch, you should be prepared to take shelter from thunderstorms. Severe Thunderstorm Watches are generally issued for 6-hour periods.

Severe Thunderstorm Warning

A Severe Thunderstorm Warning means that thunderstorms capable of strong winds and/or large hail are occurring or could form at any time. If you are in the area of a severe thunderstorm, you should take shelter indoors immediately, avoid windows, and be prepared for high winds and hail. Severe Thunderstorm Warnings are generally in effect for an hour or less.

High Wind Watch

A High Wind Watch is issued when sustained winds exceeding 40 mph and/or frequent gusts over 60 mph are likely to develop in the next 24 to 48 hours. For summit areas, high wind watches are issued when sustained winds are expected to exceed 45 mph and/or frequently gust over 60 mph. If you are in an area for which a High Wind Watch has been issued you should secure loose objects outdoors that may blow about and avoid outdoor activity that exposes you to high winds.

High Wind Warning

A High Wind Warning is issued when sustained winds exceeding 40 mph and/or frequent gusts over 60 mph are occurring or imminent. For summit areas, warnings are issued for winds exceeding 45 mph and/or frequently gusting over 60 mph. Wind warnings may issued up to 24 hours ahead of the onset of high winds and remain in effect for 6 to 12 hours. If you are in an area where a high wind warning is in effect you should avoid activities that expose you to high winds. Loose objects may be blown around. Tree limbs may break and fall. Power lines may be blown down.

Wind Advisory

A Wind Advisory is issued when sustained winds of 30 to 39 mph and/or frequent gusts to 50 mph or greater are occurring or imminent. Wind advisories may be in effect for 6 to 12 hours. If you are in an area where a wind advisory is in effect you should secure loose objects that may be blown about outdoors and limit activity that may expose you to high winds.

Work Safely: If you will be working on a windy day, you should be alert and protected. Wear eye protection to prevent dust and other particles from entering or striking your eyes. Keep your hard hat on at all times to prevent injuries from falling or flying objects. The likelihood of falls from heights is greatly increased by strong winds. Wear the necessary PPE to ensure your safety.

To avoid flying debris and to minimize damage during high winds:

- Shut down outdoor activities involving work at elevation on ladders, scaffolding, aerial lifts, etc.; handling large tarps and plastic sheeting when wind speeds exceed 25 mph; including work with radioactive materials and highly toxic materials that could be dispersed by the winds.
- At 13 - 18 mph wind will raise dust. Follow the dust action level.

- Move mobile items stored outside to indoor storage.
- Secure any items that cannot be moved inside.
- Be careful opening exterior doors.
- Be cautious about downed power lines, tree limbs, and debris on roads.
- Be alert for animals who have escaped from farms and zoos.

Stay Away from Power Lines: High winds can cause tree limbs to fall on power lines resulting in electrocution hazards or loss of power. Your best bet is to keep your distance.

Tornados

What is a TORNADO?

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud. It is spawned by a thunderstorm or as a result of severe weather associated with hurricanes. A funnel cloud is formed as cool air overrides a layer of warm air, forcing the warm air to rise rapidly. The damage from a tornado results from high wind velocity and wind blown debris.

Tornado Safety

When a tornado approaches, you have only a brief amount of time to make life-or-death decisions. Advance planning and quick response are the keys to surviving a tornado.

Purchase a NOAA Weather Alert radio with an alert feature. When tuned to the proper frequency, these weather radios remain silent until a weather emergency occurs. Once they pick up the alarm tone, they will begin broadcasting emergency weather information so that citizens can protect themselves and their property. Some models of the NOAA weather radio incorporate the Specific Area Message Encoder technology, allowing users to target only those warnings that affect their immediate geographic area.

Conduct tornado drills. Designate an area to serve as your safe area, and practice having team members assemble there in response to a mock tornado warning.

Emergency Communications Plan. Develop an emergency communications plan in case team members are separated from one another when a tornado warning goes into effect. Designate an emergency coordinator. Instruct everyone to contact this coordinator in a weather emergency for instructions on what to do during the storm and where to reassemble after the emergency has passed. Design contingency plans to be consistent with client contingency plans. When possible use client warning and alerting systems and confirm that team members have access to shelters and know how to get to them.

Know the Difference between a Tornado Watch and a Tornado Warning

Tornado Watch: Issued by the National Weather Service when tornadoes are possible in your area. You should remain alert for approaching storms. Remind family members of where the safe areas are within your home, and carefully monitor radio or television reports for further developments.

Tornado Warning: Indicates that a tornado has been sighted in your area, or is indicated on weather radar. You should proceed to safe shelter immediately.

When A Tornado Warning Goes In Effect, Put Your Safety Plans In Action.

In Your Automobile: Motor vehicles are easily overturned by tornado winds. Leave your vehicle and seek shelter in a sturdy building. As a last resort, seek shelter in a ditch or culvert. Do not try to outrun or outmaneuver a tornado! Use the time to seek appropriate shelter outside your vehicle.

Office Buildings, Hotels, and Shopping Centers: Take shelter in an interior hallway on a lower floor. A closet, bathroom or other small room with short, stout walls will give some protection from collapse and flying debris. Otherwise, get under heavy furniture and stay away from windows. Many tornado deaths have occurred in large buildings due to the collapse of a roof or wide span wall. A corner area, away from a window, is safer than the middle of a wide span wall.

Out In Open Country: When severe weather approaches, seek inside shelter immediately. The chances of encountering falling trees, downed power lines and lightning are far greater than encountering a tornado itself. If a tornado approaches, lie flat in the nearest depression, such as a culvert or ditch, and cover your head with your arms.

BE ALERT TO CHANGING WEATHER CONDITIONS

HAVE AN EMERGENCY WEATHER PLAN IN PLACE

REHEARSE YOUR CONTINGENCY PLANS PERIODICALLY

KNOW WHERE TO GO WHEN A TORNADO THREATENS.

FLD 05 HEAT STRESS PREVENTION AND MONITORING

Heat stress may occur at any time work is performed at elevated temperatures. If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur such as fatigue, irritability, anxiety, and decreased concentration or dexterity, and possibly death. Because heat stress is one of the most common and potentially serious illnesses at field sites, regular monitoring and other preventive measures are vital to ensure worker safety. Wearing chemical protective clothing often decreases natural body heat loss (cooling) and increases the risk of heat stress.

Employees who are taking prescription or over-the-counter medications should consult with their personal physician prior to working in high-temperature environments to see if their medication would impair their ability to handle heat stress.

REFERENCES

OSHA 29 CFR 1910 and 1926

RELATED FLDs

FLD 02 – Inclement Weather
FLD 03 – Hot Processes – Steam, Low Temperature Thermal Treatment Unit, and Transportable Incinerator
FLD 08 – Confined Space Entry Program
FLD 36 – Welding/Cutting/Brazing/Radiography
FLD 37 – Pressure Washers/Sandblasting

PROCEDURE

Heat Stress Symptoms and Treatment

Heat Rash

Heat rash, also known as prickly heat, may occur in hot and humid environments where sweat is not easily removed from the surface of the skin by evaporation and is aggravated by chafing clothes. When extensive or complicated by infection, heat rash can be so uncomfortable that it inhibits sleep and impairs a worker's performance.

Symptoms – Mild red rash, especially in areas of the body that come into contact with protective gear.

Treatment – Decrease amount of time spent working in protective gear and provide body powder to help absorb moisture and decrease chafing. Heat rash can be prevented by showering, resting in a cool place, and allowing the skin to dry.

Heat Cramps

Heat cramps are caused by inadequate electrolyte intake. The individual may be receiving adequate water; however, if not combined with an adequate supply of electrolytes, the blood can thin to the point where it seeps into the active muscle tissue, causing cramping.

Symptoms – Acute painful spasms of voluntary muscles, most notably the abdomen and extremities.

Treatment – Move the victim to a cool area and loosen clothing. Have the victim drink 1 to 2 cups of cool potable water or diluted commercial electrolyte solution (e.g., Gatorade, Quench) immediately, and then every 20 minutes thereafter until symptoms subside. Electrolyte supplements can enhance recovery; however, it is best to double the amount of water required by the dry mix package directions or add water to the liquid form.

Heat Exhaustion

Heat exhaustion is a state of weakness or exhaustion caused by the loss of fluids from the body. Heat exhaustion is not as dangerous as heat stroke, but if not properly managed in the field it may lead to heat stroke.

Symptoms – Pale, clammy, and moist skin, profuse perspiring, and extreme weakness. Body temperature is normal, pulse is weak and rapid, and breathing is shallow. The person may have a headache, may vomit, may feel dizzy, and may be irritable or confused.

Treatment – Move the victim to a cool, air-conditioned or temperature-controlled area, loosen clothing, place in a position with the head lower than the feet (shock prevention), and allow the victim to rest. Consult a physician. Ensure that the victim is not nauseated or vomiting. If not nauseated or vomiting, give the victim small sips of cool water or diluted electrolyte replenishment solution (one to one dilution with water, or if mixing from powder, double the water added). If this is tolerated, have the victim drink 1 to 2 cups of fluid immediately, and every 20 minutes thereafter until symptoms subside. Seek medical attention at the advice of the consulting physician.

Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of the body's heat regulating mechanisms, i.e., the individual's temperature control system (sweating) stops working correctly. Body temperature rises so high that brain damage and death may result if the person is not cooled quickly.

Symptoms – Red, hot, dry skin (although the person may have been sweating earlier); nausea, dizziness, confusion, extremely high body temperature (i.e., 104°F or greater as measured with an oral thermometer), rapid respiratory and pulse rate, seizures or convulsions, unconsciousness or coma.

Treatment – Immediately call for emergency medical assistance. Remove the victim from the source of heat and cool the victim quickly. If the body temperature is not brought down quickly, permanent brain damage or death may result. Remove all PPE and as much personal clothing as decency permits. Fan the person while sponging or spraying with cool or tepid water. Apply ice packs (if available) to the back of the neck, armpits, groin area, or behind the knees. Place the victim flat on their back or with head and shoulders slightly elevated. If conscious, and not nauseated or vomiting, the victim may be provided sips of cool water. Do not give the victim coffee, tea, or alcoholic beverages. Emergency medical personnel will take over treatment when they arrive.

Recognition and Risk Assessment

In the planning stages of a project, the potential for heat stress disorders must be considered as a physical hazard in the site-specific Health and Safety Plan (HASP). Risk assessment can be accomplished in the development stages of a project by listing in the HASP the most likely heat stress disorders that may occur. The Field Safety Officer (FSO) must make decisions on the proper safety procedures and recommend them to the site manager. Each worker must evaluate the risk associated with his or her work and be actively alert to these hazards. Any site worker may stop work if safety procedures are not followed or the risk is too great. In addition, all site personnel must be aware of these symptoms in both themselves and their co-workers.

Prevention and Protection Programs

Heat stress is affected by several interacting factors including, but not limited to, age, obesity, physical condition, substance abuse, level of personal protective equipment (PPE) worn, and environmental conditions (temperature, shade, and humidity). Site workers must learn to recognize and treat the various forms of heat stress. The following recommendations should be followed to prevent heat stress:

- The most important measure to prevent heat-related illness is adequate fluid intake. Workers should drink 1/2 to 1 quarts of liquids per hour in high heat conditions. Most of this liquid should be water. Under heavy work and heat conditions, the body may lose up to 2 gallons of fluids per day. To prevent heat stress symptoms, the individual must ensure replacement of this fluid.
- Provide disposable cups that hold about 4 ounces, and water that is maintained at 50 to 60°F. Workers should drink 16 ounces of water before beginning work, and a cup or two at each break period.
- Provide a shaded area for rest breaks. Ensure that adequate shelter is available to protect personnel against heat and direct sunlight. When possible, shade the work area.
- Discourage the intake of caffeinated drinks during working hours.
- Monitor for signs of heat stress.
- Encourage workers to maintain a good diet during these periods. In most cases, a balanced diet and lightly salted foods should help maintain the body's electrolyte balance. Bananas are especially good for maintaining the body's potassium level.
- If utilizing commercial electrolyte mixes, double the amount of water called for in the package directions. Indications are that "full-strength" preparations taken under high heat stress conditions may actually decrease the body's electrolytes.
- Acclimate workers to site work conditions by slowly increasing workloads (i.e., do not begin work activities with extremely demanding tasks).
- Rotate shifts of workers who are required to wear impervious clothing in hot weather.
- Encourage workers to wear lightweight, light-colored, loose-fitting clothing.
- In extremely hot weather, conduct field activities in the early morning and evening.
- Provide cooling devices to aid natural body heat regulation. These devices, however, add weight and their use should be balanced against worker efficiency. An example of a cooling aid is long cotton underwear, which acts as a wick to absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing.
- Good hygienic standards must be maintained by frequent showering and changes of clothing.
- Clothing should be permitted to dry during rest periods.
- Whenever working in the sun, provide employees with sunscreen with both UVA and UVB protection.
- Persons who notice skin problems should immediately consult medical personnel.

Heat Stress Monitoring and Work Cycle Management

When strenuous field activities are part of on-going site work conducted in hot weather, the following guidelines should be used to monitor the body's physiological response to heat, and to manage the work cycle, even if workers are not wearing impervious clothing. These procedures should be instituted when the temperature exceeds 70°F and the tasks/risk analysis indicates an increased risk of heat stress problems. Consult the HASP and a safety professional (e.g., Division EHS Manager, FSO) if questions arise as to the need for specific heat stress monitoring. In all cases, the site personnel must be aware of the signs and symptoms of heat stress and provide adequate rest breaks and proper aid as necessary.

Measure Heart Rate – Heart rate should be measured by the radial pulse for 30 seconds as early as possible in the rest period. The heart rate at the beginning of the rest period should not exceed 110 beats per minute. If the heart rate is higher, the next work period should be shortened by 33%, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats per minute at the beginning of the next rest period, the following work cycle should be further shortened by 33%. The procedure is continued until the rate is maintained below 110 beats per minute.

Measure Body Temperature – When ambient temperatures are over 90°F, body temperatures should be measured with a clinical thermometer as early as possible in the rest period. If the oral temperature exceeds 99.6°F (or 1 degree change from baseline) at the beginning of the rest period, the following work cycle should be shortened by 33%. The procedure is continued until the body temperature is maintained below 99.6°F (or 1 degree change from baseline). Under no circumstances should a worker be allowed to work if their oral temperature exceeds 100.6°F.

Measure Body Water Loss – Body water loss greater than 1.5% of total body weight is indicative of a heat stress condition. Body weight is measured before PPE is donned and after the PPE is removed following a work cycle. Body water loss can be measured with an ordinary bathroom scale; however, the scale must be sensitive to one-half pounds increments. A worker is required to drink additional fluids and rest if their body water loss is greater than 1.5%.

NOTE: For purposes of this operating practice, a break is defined as a 15-minute period and/or until an individual's vital signs are within prescribed guidelines.

A physiological monitoring schedule is determined by following the steps below:

- Measure the air temperature with a standard thermometer.
- Estimate the fraction of sunshine by judging what percent the sun is out (refer to Table 1).
- Calculate the adjusted temperature based on the following formula:

  Adjusted Temperature = Actual Temperature + 13 X (where X = sunshine fraction from Table 1)
- Using Table 2, determine the physiological monitoring schedule for fit and acclimated workers for the calculated adjusted temperature.

The length of work period is governed by frequency of physiological monitoring (Table 2). The length of the rest period is governed by physiological parameters (heart rate and oral temperature).

Table 1. Percent Sunshine Factors
Heat Stress Prevention and Monitoring

Percent Sunshine (%)	Cloud Cover	Sunshine fraction
100	No cloud cover	1.0
50	50% cloud cover	0.5
0	Full cloud cover	0.0

Table 2. Physiological Monitoring Schedule
Heat Stress Prevention and Monitoring

Adjusted Temperature	Level D (Permeable clothing)	Level C, B, or A (Nonpermeable clothing)
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°F (30.8° - 32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5° - 87.5°F (28.1° - 32.2°C)	After each 90 minutes of work	After each 60 minutes of work
77.5° - 82.5°F (25.3° - 28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5° - 77.5°F (22.5° - 25.3°C)	After each 150 minutes of work	After each 120 minutes of work

Example: Site personnel anticipate wearing level C (impermeable clothing) during site activities. The air temperature is 80°F and there are no clouds in the sky (100% sunshine). The adjusted temperature is calculated in the following manner:

Adjusted Temperature (Adj T °F) = Actual Temperature (Amb T °F) + (13 x sunshine fraction)
Adj T °F = 80°F + (13 x 1.0)
Adj T °F = 93°F

Using Table 2, the pulse rate, oral temperature and body water loss monitoring would be conducted after each 15 minutes of work. The adjusted temperature may need to be redetermined if the percent sunshine and ambient temperature changes drastically during site work.

If an individual's heart rate exceeds 110 beats per minute at the beginning of the rest period, that individual will continue to rest until his or her heart rate drops to baseline; the next work period is then decreased by 33%.

FLD 10 MANUAL LIFTING AND HANDLING OF HEAVY OBJECTS

Improper lifting can result in cuts, pinches, crushing, and serious injury to back, abdomen, arm and leg muscles, and joints. Even relatively light objects, lifted improperly, can contribute to injury. Muscle and joint injuries occur when objects to be lifted are too heavy or awkward, are lifted improperly, or in areas where access is restricted. Lifting tasks which are awkward and repetitive, even if involving only light objects, can lead to nerve and joint damage.

At the project level, the need for manual lifting or handling of heavy objects must be identified as a physical hazard in the planning stages of a project Health and Safety Plan (HASP).

MANUAL LIFTING

Plan any manual lifting task noting the following:

Contact hazards. Check each object before lifting for presence of splinters, slivers, sharp edges or parts, cracks and loose joints, which can result in cuts. Signs of biological hazards, and chemical or radioactive material contamination.

- **Weight of object**. Unless involved in weight training, recommended safe lifting weights for an average man or woman are 50 and 35 pounds, respectively.
- **Size and shape of object**. Large and oddly shaped objects are more difficult to lift, even within safe weight limits, due to imbalanced center of gravity.
- **Area in which lifting is to be done.** Heavy objects can pinch or crush fingers, toes, arms, and legs between the object and nearby objects (e.g., walls, tables, counters, or railings). Check for pinch points such as other objects close by and ensure there is room for safe lifting.
- **Conditions under which lifting is to be accomplished.** Check for wet or slippery surfaces. Consider level of protection to be used. Level B or A protection may add up to 40 lbs. To be lifted, as well as restricting range of motion and adding to area restriction by increasing bulk.

Route to be traveled, if lifting includes carrying. Check walking and working surfaces for slip and trip hazards, note ramps, changes in level of elevation, and ladders or stairways that need to be negotiated.

Manual Lifting - Prevention and Protection

- Before lifting, identify the potential for contact hazards on objects to be lifted. Check each object before lifting, remove any noted hazards as feasible, and wear gloves (cotton, at a minimum, or leather, kevlar, or chemical resistant material, depending on the nature of the hazard).
- Avoid contact with, or cover cracks or loose joints to reduce hazards of pinching.
- Workers must know their lifting limitations, plan before lifting, keep themselves in good physical condition, and get help if uncertain that they can lift safely. Managers must plan and allow for safe lifting.
- When lifting an object from the floor:
  - Determine that the object is within the safe weight limit.
  - Check for contact hazards.
  - Walk the intended route of travel to identify and remove slip and fall hazards.
  - Identify changes in elevation, steps, ramps, stairs and ladders that must be negotiated.

- To lift square or rectangular objects:
  - Avoid reaching as you lift.
  - Set feet firmly, placing one foot alongside the load and the other slightly behind the load.
  - Keep objects close to the body.
  - Squat in front of the load.
  - Grasp one of the top corners away from the body and the opposite bottom corner closest to the body.
  - Tilt the object slightly away from the body, tilt forward at the hips, keep the back straight and tuck in the chin.
  - Straighten the legs, keeping the spine straight, pull the object into the body and stand up slowly and evenly without jerking or twisting.

If turning or change of direction is required, turn with feet without twisting the torso and step in the direction of travel

To set an object down, reverse the sequence, being sure not to trap the bottom hand between the object and the surface on which the object is set.

Workers must be trained and have the opportunity to use the above steps with lighter objects before performing heavy lifting. **For odd-shaped objects, the only modification needed should be hand-hold position**. When two or more persons are lifting, have a plan and a set of signals so lifting occurs simultaneously.

Do not carry objects in a manner which obstructs vision in the line of travel.

Carry objects so one hand is free to hold the handrail on stairs and that there is an unobstructed view of footing. Carry objects in a manner to permit use of both hands while climbing a ladder.

MANUAL HANDLING OF HEAVY OBJECTS

Manual handling of heavy objects, even when not lifting, can pose the same hazards as lifting including cuts, pinches, bruises, crushing, muscle and joint strain, and contact with hazardous materials and biological hazards.

Drums and other containers which must be maneuvered for access to information or sampling locations, that are inaccessible to mechanical handling equipment, require manual handling and special precautions. When handling of heavy objects does not involve lifting, workers can handle heavier objects safely, even those weighing several hundred pounds, if proper techniques are used. In many instances, the procedures involve balancing and taking advantage of the shape of the object.

Manual Handling - Prevention and Protection

Prior to performing manual handling, it must be determined that it can be done safely and that mechanical assistance is infeasible. Mechanical equipment or assistance such as dollies, carts, come-alongs or rollers are to be used whenever possible. Mechanical assistance must be of proper size, have wheels sized for the terrain, and be designed to prevent pinching or undue stress on wrists. Objects to be moved must be secured to prevent falling and properly balanced to prevent tipping.

The minimum protection for manual handling is heavy cotton or leather gloves, safety boots, and coveralls. Metatarsal guards, chemical protective clothing, and metal mesh or kevlar gloves must be used as risk increases of heavy items falling, hazardous materials contact and sharp edges, splinters or slivers.

Workers must be aware of and work within their weight-handling capabilities.

Objects to be manually handled must be checked for contact hazards before handling, and to ensure handling will not trap hands, arms, legs, or feet between the object and other objects, walls, or railings.

Properly trained personnel may roll heavy objects with a round base such as 55-gallon drums or compressed gas cylinders, if rolling will not damage the structural integrity. Rolling must be controlled by chutes, tag-lines, or other means of limiting acceleration. Use of the legs for pushing and tag-line control of rolled objects must be stressed.

Only properly trained personnel may move cylindrical objects which must remain upright by hand. Cylindrical objects, such as drums that must remain upright, are handled manually by slightly tilting the object, using the legs for control, and balancing the object on the bottom edge. The handler then walks beside the object, with the object tilted toward the body, positioning the hands on the top edge away from the body and moving so they do not cross, thus maintaining balance and a steady controlled forward motion.

Prior to moving cylindrical objects in this way, the route of travel must be walked to identify any changes of elevation, pot holes, or other obstructions that could cause the object to snag, tip, or get out of control.

Flat, square, or rectangular objects are most easily handled using make-shift rollers or skids to break the friction with the resting surface and pushing, using the legs.

FLD 11 ROUGH TERRAIN/ATV USE

RELATED FLDs

FLD 02 – Inclement Weather
FLD 05 – Heat Stress Prevention and Monitoring
FLD 06 – Cold Stress
FLD 22 – Heavy Equipment Operation
FLD 47 – Clearing, Grubbing, and Logging Operations
FLD 57 – Motor Vehicle Safety

HAZARD

Physical hazards associated with rough terrain include vehicle accidents, heavy equipment incidents, falling, slipping, and tripping.

Driving vehicles on uneven surfaces creates a possibility of the vehicle rolling, getting stuck in mud or ditches, or of an accident due to flat tires or striking obstacles and other vehicles.

When working on foot, step inclines and heavy or downed vegetation can hide holes or breaks in the terrain, increasing the risk of slips, trips, and falls.

RECOGNITION AND RISK ASSESSMENT

Rough terrain complicates work activities and adds to or increases risk. In the planning stages of a project, rough terrain must be considered as a physical hazard and identified in the site-specific health and safety plan (HASP). Risk assessment is usually accomplished from site history information (i.e., site topography) and on site by the Field Safety Officer (FSO).

HAZARD PREVENTION AND PROTECTION PROGRAMS

Safety on Foot

Personnel working on rough terrain should maintain a high level of physical conditioning due to increased body stress and exertion.

The site crew should be alert and observe terrain while walking to minimize slips, trips, and falls.

Boots should be ankle high or higher to provide additional support and stability.

Work will be completed in adequate natural light or sufficient illumination will be maintained.

Site personnel will conduct an initial walkover and the "buddy system" will be implemented.

Emergency communications such as a cell phone or two-way radio should be carried at all times.

Personnel should be aware of potential hazards and ensure the availability of first-aid supplies and knowledge of the location of the nearest medical assistance.

VEHICLE SAFETY

Vehicle drivers and passengers will wear seatbelts at all times.

Hazards can be prevented by ensuring regular maintenance is performed on vehicles and all safety features are working. Have brakes and wheel bearings of vehicles used off road or in four wheel drive inspected at increased frequency (suggest inspections at twice the manufacturer's recommended frequency).

In order to minimize accidents, site surveillance on foot may be required to ensure clear driving paths.

Minimize side hill travel. Travel straight up and down hills whenever possible. Passengers will not be allowed when side hill travel is required.

Take into account loads or superstructure of vehicles which raise the center of gravity and increase risk of tipping.

Cross streams, small logs or other passable (there is adequate clearance of the undercarriage) obstructions at right angles.

Four wheel drive vehicles should be used if terrain conditions are wet, frozen, broken, or otherwise deemed unsafe for two wheel drive vehicles by the FSO. Use of vehicles off-road will be specifically addressed in the HASP and personnel operating vehicles will be checked for proficiency.

- Before moving a vehicle in the field, first walk the route of travel, inspecting for depressions, stumps, gullies, ruts, and similar obstacles.
- Always check the brakes of a vehicle before traveling, particularly on rough, uneven, or hilly ground.
- Check the complete drive train of a carrier at least weekly for loose or damaged bolts, nuts, studs, shafts, and mountings.
- Engage the all wheel drive when traveling off highway on hilly terrain.
- Increase tire pressures before traveling in hilly terrain (do not exceed rated tire pressure).
- Use the assistance of someone on the ground as a guide when lateral or overhead clearance is close.
- After the vehicle/equipment has been moved to a new site, set all brakes and/or locks. When grades are steep, block the wheels.

Definitions

Class I, All-terrain vehicle (ATV): A motorized off-highway vehicle, 50 in. (127 cm) or less in width, having dry weight of 800 lbs (362.9 kg) or less, and traveling on three or more low pressure tires (10 lbs [4.5 kg] psi or less), with a seat designed to be straddled by the operator.

Class I, Category G, ATV: An ATV intended for general recreational and utility use.

Class I, Category U, ATV: An ATV intended primarily for utility use.

Class II, ATV: A motorized off-highway vehicle with a width which exceeds 50 in. (127 cm) or having a dry weight that exceeds 800 lbs (362.9 kg), traveling on four or more low-profile, low-pressure tires (10 lbs [4.5 kg] psi or less) and having a bench seat.

NOTE: Utility Vehicles are designed to perform off-road utility tasks such as passenger and cargo transportation and are addressed separately below. Examples are Rangers, Rhino, M-Gators, Gators, and Mules.

Rollover Protective Structure (ROPS). A cab or frame that provides a safe environment for the tractor operator in the event of a rollover.

ALL TERRAIN VEHICLES (ATVS)

Qualifications

ATV operators will have completed a nationally recognized accredited ATV training course (such as provided by the Specialty Vehicles Institute of America or in-house resources that have been certified as trainers by an accredited organization) prior to operation of the vehicle.

The operator must pass an operating skills test prior to being allowed to operate an ATV. Proof of completion of this training will be maintained.

Equipment

All ATVs shall be equipped with:

- An operable audible warning device (horn);
- Headlights (if it will be used during hours of darkness);
- Taillights; and
- Brake lights.
- Mufflers and spark arresters.

All Class II ATVs will be equipped with ROPS and seatbelts

Operation

Only Class I and Class II ATVs with four or more wheels may be used. Class III ATV's may not be used.

The manufacturer's recommended payload will not be exceeded at any time.

Gloves and an approved motorcycle helmet with full-face shield or goggles will be worn at all times while operating a Class I ATV.

An ATV will not be driven on public roadways except to cross the roadway, and it will only be driven on a public roadway at designated crossing points or with a road guard (no paved road use unless allowed by the manufacturer).

A copy of the operator's manual will be kept on the vehicle and protected from the elements (if practicable).

Tires shall be inflated to the pressures recommended by the manufacturer.

Passengers are prohibited on Class I ATVs.

UTILITY VEHICLES

Utility vehicles are defined as specialty Class II ATVs designed to perform off-road utility tasks such as passenger and cargo transportation. Examples are Rangers, Rhino, M-Gators, Gators, and Mules.

Utility vehicle operators shall be trained and familiar with the use of all controls; understand proper moving, stopping, turning and other operating characteristics of the vehicle. Operators must review all training materials provided by the manufacturer for the specific vehicles, and training should be in accordance with appropriate manufacturer recommendations. A copy of the operator's manual shall be kept on the vehicle at all times and protected from the elements. At a minimum, training should address:

- Basic riding tips from the manufacturer's published literature for each vehicle.
- Reading terrain.
- Climbing hilly terrain.
- Descending a hill.
- Traversing a slope.
- Riding through water.
- Cargo carriers and accessories.
- Loading and unloading.
- Troubleshooting.
- Proper preventative maintenance, (i.e., oil levels, tire pressure requirements and scheduled maintenance requirements according to the manufacturer's guidelines.).

Utility vehicles shall be equipped with:

- Operable audible warning device (horn).
- Headlights.
- Taillights.
- Brake lights.
- Seatbelts.
- ROPS.

Occupancy in utility vehicles is limited to manufacturer designated seating that has built-in seatbelts. Passengers may not ride in the vehicle's back cargo area unless the vehicle is otherwise equipped. Note: When used for emergency response, medical litters may be placed in the back cargo area but must be secured as described below.

The manufacturer's recommended load carrying capacity, personnel capacity, or maximum safe vehicle speed shall not be exceeded at any time.

Cargo items will be secured as necessary to prevent movement/tipping. All loads over fifty pounds (to include medical litters) must be securely strapped to cargo tie-downs in the rear and to the cargo shelf in the front.

Seatbelts will be worn by operators and passengers of specialty vehicles where installed by the manufacturer. Operators and passengers shall wear goggles at all times when a utility vehicle, not equipped with a windshield, is in motion.

Utility vehicles will not normally be driven on public roadways except to cross the roadway, and will only be driven on a public roadway at designated crossing points or with a road guard. Utility vehicles that are allowed to operate outside a controlled work area and/or on public roads will meet the minimum vehicle safety standards in accordance with 49 CFR 571.5, to include ROPs, seatbelts and placement of "Slow Moving Vehicle" emblems where required.

Manufacturer-installed safety equipment will be maintained in working order and used in compliance with the requirement of this regulation and in accordance with manufacturer's recommendations.

RULES

Observe the following practices to help prevent accidents:

- Do not misuse utility vehicles.
- Reduce speed and exercise extreme caution on slopes or on rough ground.
- Do not overload vehicle and avoid shifting loads. Reduce load when operating over rough or hilly terrain.
- Do not stop or start suddenly when going uphill or downhill. Be especially cautious when changing direction on slopes.
- Stay alert for holes, rocks, and other hidden hazards in the terrain.
- Keep away from drop-offs, ditches, embankments, as well as ponds and other bodies of water. The machine could suddenly turn over if a wheel is over the edge of a cliff or ditch, or if an edge caves in.
- Keep front wheels straight at crest of hill or going over bumps.
- When descending a hill, remove foot from accelerator and apply brakes to reduce speed and maintain control.

Transport Loads Safely

- Be sure load is evenly distributed.
- Do not load above the load guard.
- Securely anchor all loads in cargo box.
- Reduce cargo box capacity when operating on rough or hilly terrain.
- Use existing trails. Avoid terrain such as dangerous slopes and impassable swamps. Watch carefully for sharp bumps, holes, ruts, or obstacles.
- Look ahead at terrain. Know what is coming and be prepared to react. Be alert for hazards.
- Keep front wheels straight at the crest of a hill or going over bumps.
- Reduce speed according to trail, terrain, and visibility conditions.
- The passenger should always use the hand holds.

Climbing or Descending a Hill

- Always use the brakes when going down slopes, the utility vehicle can speed up (freewheel) going down a slope. Engine or clutch braking effect is minimal.
- Balance loads evenly and secure them. Braking could shift the load and affect vehicle stability.
- Sit on the center of the seat and keep both feet within the foot platform.
- Never drive past the limit of visibility. Slow down near the crest of a hill until getting a clear view of the other side.
- If the vehicle stops or loses power going up a hill, lock the park brake to hold the vehicle on slope. Maintain direction of travel and release the brake slowly. Back straight down hill slowly while maintaining control. Do not turn the vehicle sideways. The vehicle is more stable in a straight forward or rearward position.
- If the utility vehicle begins to tip, turn the front wheel downhill to gain control before proceeding.

Riding Through Water

- Avoid water whenever possible. If the drive belt becomes wet, slippage will occur and the vehicle will lose power.
- Never cross any body of water where the depth may be unknown to the operator. As an operational guideline, deep water is considered anything in excess of 152 mm (6 in.) in depth. Tires may float, making it difficult to maintain control.
- Choose a course within the waterway where both banks have a gradual incline. Cross at a point known to be safe.
- Proceed at a slow steady speed to avoid submerged obstacles and slippery rocks.
- Avoid water crossings where the operation of a utility vehicle may cause damage to waterway beds or erode waterway shoreline.

FLD 12 HOUSEKEEPING

Hazards associated with poor housekeeping include but are not limited to slips, trips, falls, punctures, cuts, and fires. Good housekeeping is a critical element when working under all FLDs. Housekeeping inspection checklists are available on-line on the Weston Environmental, Health, and Safety (EHS) Portal site.

RECOGNITION AND RISK ASSESSMENT

Good housekeeping is an important element of incident prevention. Good housekeeping should be planned at the beginning of the job and carefully supervised and monitored through project completion.

Housekeeping requirements must be addressed in the planning stages of a project Health and Safety Plan (HASP). Risk assessment can be accomplished in the development stages of a project by listing in the site-specific HASP, good housekeeping requirements and the hazards associated with poor housekeeping (e.g., slips, trips and falls). The Field Safety Officer (FSO) must make decisions on the proper safety procedures and recommend them to the site manager. Each worker must evaluate the risk associated with his or her work and be actively alert to these hazards. Any site worker may stop work if safety procedures are not followed or the risk is too great.

PREVENTION AND PROTECTION

Incidents can be prevented or minimized by following the general guidelines described below:

1. Plan ahead. A materials storage area which has been planned is more orderly than one which has developed haphazardly.
2. Assign responsibilities. If the size of the job and work force merit, a person should be assigned specific responsibility for clean up. Ideally, each individual should pick up his or her work area and help keep the site neat.
3. Implement the program. Housekeeping must be part of the daily routine, with clean-up being a continuous procedure.

Incidents caused by poor housekeeping can also be prevented by adherence to the following rules.

Lunch areas should be kept clear of empty bottles, containers, and papers. Trash disposal cans should be provided. An effective means of preventing litter is the provision of suitable receptacles for hazardous waste as well as no hazardous waste.

Accumulation of flammable and combustible liquids on floors, walls, and other areas is prohibited. All spills of flammable and combustible liquids must be cleaned up immediately.

Combustible waste such as soiled rags and paper is to be stored in a safe place (e.g., covered metal container) and disposed of regularly.

Materials must be stacked and stored to prevent sliding or collapsing.

WESTON project managers and WESTON subcontractors should provide sufficient personnel and equipment to ensure compliance with all housekeeping requirements.

Work will not be allowed in areas that do not comply with the requirements of this FLD.

The FSO and WESTON subcontractors will inspect the work area daily for adequate housekeeping and record findings on the daily inspection report.

Adequate lighting should be provided in or around all work areas, passageways, stairs, ladders, and other areas used by personnel.

All stairways, passageways, gangways, decontamination lines, and accessways shall be kept free of materials, supplies, and obstructions at all times.

Loose or light material should not be stored or left on roofs or floors that are not enclosed, unless it is safely secured.

Tools, materials, extension cords, hoses, or debris are to be used, disposed of, and stored so as not to cause a tripping or other hazard.

Tools, materials, and equipment subject to displacement or falling should be adequately secured.

Empty bags that contained lime, cement, and other dust-producing materials should be removed periodically, as specified by the designated authority.

Protruding nails in scrap boards, planks, and timbers should be removed, hammered in, or bent over flush with the wood, unless placed in containers or trucks for removal.

Walkways, runways, and sidewalks should be kept clear of excavated material or other obstructions and no sidewalks should be undermined unless shored to carry a minimum live load of 125 pounds per square foot.

Containers should be provided for storing or carrying rivets, bolts, and drift pins, and secured against accidental displacement when aloft.

When rivet heads are knocked off or backed out, they should be prevented from falling.

Form and scrap lumber and debris should be cleared from work areas, passageways, and stairs in and around building storage yards and other structures.

All storage and construction sites should be kept free of the accumulation of combustible materials.

All materials should be maintained in neat stockpiles for ease of access. Aisles and walkways should be kept clear of loose materials and tools.

Areas prone to weeds and grass should be kept mowed. A standard procedure should be established for cleanup of such areas, as specified by the FSO.

Rubbish, brush, long grass, or other combustible material must be kept from areas where flammable and combustible liquids are stored, handled, or processed.

FLD 22 EARTH MOVING EQUIPMENT/MATERIAL HANDLING EQUIPMENT

REFERENCES

29 CFR Part 1926 Subparts 600-602

RELATED FLDs

FLD 23 – Cranes, Rigging, and Slings
FLD 24 – Aerial Lifts/Manlifts
FLD 34 – Utilities
FLD 35 – Electrical Safety

PROCEDURE

These rules apply to the following types of earthmoving equipment: scrapers, loaders, crawler or wheel tractors, bulldozers, off-highway trucks, graders, agricultural and industrial tractors, and similar equipment.

Machinery and Mechanized Equipment Safety

Before any machinery or mechanized equipment is placed in use, it will be inspected and tested by a competent mechanic and certified to be in safe operating condition.

WESTON will designate a competent person to be responsible for the inspection of all machinery and equipment daily and during use to make sure it is in safe operating condition. Tests will be made at the beginning of each shift during which the equipment is to be used to determine that the brakes and operating systems are in proper working condition.

Preventative maintenance procedures recommended by the manufacturer will be followed.

Any machinery or equipment found to be unsafe shall be removed from service and its use prohibited until unsafe conditions have been repaired or corrected.

Inspections or determinations of road conditions and structures will be made in advance to ensure that clearances and load capacities are safe for the passing or placement of any machinery or equipment.

Machinery and mechanized equipment will be operated only by designated personnel. Equipment deficiencies observed at any time that affect safe operation will be corrected before continuing operation.

Seat belts shall be provided on all equipment covered by this section and shall meet the requirements of the Society of Automotive Engineers (J386-1969) and Seat Belts for Construction Equipment. Seat belts for agricultural and light industrial tractors shall meet the seat belt requirements of Society of Automotive Engineers (J333a-1970), Operator Protection for Agricultural and Light Industrial Tractors.

Seat belts shall be worn when provided by the manufacturer. Passengers shall not be allowed to ride on equipment unless equipment is designed with additional seats with safety belts.

Audible alarms. All bi-directional machines, such as rollers, compacters, front-end loaders, bulldozers, and similar equipment, shall be equipped with a horn, distinguishable from the surrounding noise level, which shall be operated as needed when the machine is moving in either direction. The horn shall be maintained in an operative condition.

Getting off or on any equipment while it is in motion is prohibited.

Machinery or equipment requiring an operator will not be permitted to run unattended.

Machinery or equipment will not be operated in a manner that will endanger persons or property, nor will the safe operating speeds or loads be exceeded.

All machinery or equipment will be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done. The only exemption is equipment designed to be serviced or maintained while running.

All repairs on machinery or equipment will be made at a location that will provide protection from traffic or other hazards to maintenance personnel.

Machinery and equipment, or parts thereof, that are suspended or held apart by slings, hoists, or jacks also will be substantially blocked or cribbed before personnel are permitted to work underneath or between them.

Bulldozer and scraper blades, front end-loader buckets, dump bodies, and similar equipment will be either fully lowered or blocked when being repaired or when not in use. All controls will be in a neutral position, with the engines stopped and brakes set, unless work being performed on the machine requires otherwise.

Stationary machinery and equipment will be placed on a firm foundation and secured before being operated.

All points requiring lubrication during operation will have fittings so located or guarded to be accessible without hazardous exposure.

When necessary, all mobile equipment and the operating area will be adequately illuminated while work is in progress.

Mechanized equipment will be shut down prior to and during fueling operations. Closed systems, with automatic shutoff that will prevent spillage if connections are broken, may be used to fuel diesel powered equipment left running.

All towing devices used on any combinations of equipment will be securely mounted and structurally adequate for the weight drawn.

Persons will not be permitted to get between a piece of towing equipment and the item being towed until the towing equipment has come to a complete stop.

All equipment with windshields will be equipped with powered wipers. Vehicles that operate under conditions that cause fogging or frosting of windshields will be equipped with operable defogging or defrosting devices.

All equipment left unattended at night, adjacent to a highway in normal use, or adjacent to construction areas where work is in progress, will have lights or reflectors, or barricades equipped with lights or reflectors, to identify the location of the equipment.

Whenever the equipment is parked, the parking brake will be set. Equipment parked on inclines will have the wheels chocked or track mechanism blocked and the parking brake set. Equipment such as lift trucks and stackers will have the rated capacity posted on the vehicle so as to be clearly visible to the operator. When auxiliary removable counterweights are provided by the manufacturer, corresponding alternate rated capacities also will be clearly shown on the vehicle. The ratings will not be exceeded.

Steering or spinner knobs will not be attached to the steering wheel unless the steering mechanism prevents road reactions from causing the steering hand wheel to spin. When permitted, the steering knob will be mounted within the periphery of the wheel.

All industrial trucks in use will meet the requirements of design, construction, stability, inspection, testing, maintenance, and operation, defined in American National Standards Institute (ANSI) B56.1, Safety Standards for Powered Industrial Trucks.

The installation of live booms on material and personnel hoists is prohibited.

The controls of loaders, excavators, or similar equipment with folding booms or lift arms will not be operated from a ground position unless so designed.

Personnel will not work or pass under the buckets or booms of loaders in operation.

Cranes and any other equipment used for lifting must be inspected as required and records of inspection must be maintained.

Drill Rigs

See FLD 56, *Drilling Safety*

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BEHAVIOR-BASED Safety Every Minute of Every Day WESTON	Weston Solutions, Inc.		Initial Issue Date	July 2012
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FLD 34 Underground Utilities			Revision No.	0
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Purpose

The purpose of this Field Operation Procedure (FLD) is to provide Best Practices and requirements for identification, location, and avoidance of underground utilities, appurtenances, and structures during intrusive activities. These requirements are applicable to all Weston Solutions, Inc. (WESTON) operations. This FLD also addresses actions to be taken in response to encountering or contacting underground utilities.

Scope

This FLD covers all employees involved in s ub-surface intrusive activity projects performed by Weston Solutions.

Key Responsibilities

Competent Person

The Competent Person shall be responsible for:

- Obtaining a copy of, and understanding the applicable regulations for the state of jurisdiction where the excavation activities are to be performed.
- Contacting the appropriate One-Call Agency or private locating service, as applicable.
- Recording One-Call locate numbers.
- If necessary, renewing One-Call locate numbers before expiration.
- Ensuring that white-lining of the area to be excavated is performed; if another equal or better protective measure is necessary because of the nature of the work, state/local regulation, or client requirements, the HASP should be amended to reflect the change.
- Ensuring that a "positive response" has be en received from every utility owner/operator identified by the One-Call Agency (and any non-member utility as necessary) and that they have located their underground utilities and have appropriately marked any potential conflicts with the areas of planned intrusive activities prior to the start of intrusive work.
- Ensuring that appropriate means for supporting and protecting any exposed utility have been discussed with the utility owner and such means are available on-site.
- Ensuring that above-ground utilities and other appurtenances will not create a problem, or be impacted by WESTON activities. In all cases provisions for protection of any utility, structure, or appurtenance must be made.

- Ensuring that provisions for emergency actions and emergency shut-off/mitigation of utilities have been discussed with utility owners and field personnel.
- Ensuring that pictures are taken before, during, and after intrusive activities and placing such pictures in the project file. Pictures should provide visual documentation of actual site conditions, including but not limited to exposed utilities, methods used for bracing utilities and markings placed on the surface by utility locating services. Consideration should also include placing of a known object in the picture field to provide a "scale" for size/distance comparison.
- Completion and maintenance of the Underground Utilities Locating and Marking Checklist (Attachment A) and the Underground Utilities Management Checklist (Attachment B).
- Reviewing applicable Activity Hazard Analyses (AHAs) with all project members before work begins.
- Conducting training on communication protocols to be used by the excavation observer and equipment operator.
- Ensuring implementation of appropriate work practices during intrusive activities (including maintaining the prescribed buffer zone for use of aggressive methods).
- Conducting daily or more frequent (due to changes in conditions) inspections of the excavation area to make sure that all markings are intact.
- Providing the Field Safety Officer (FSO) with all required documentation on a daily basis.

Observer

Whenever intrusive operations with mechanized equipment are being conducted *within three feet of the outside edge of the buffer zone*, horizontally and vertically, an observer must be assigned to monitor the activities. The observer is responsible for:

- Maintaining a safe vantage point relative to digging machinery, excavation edge, and proximity to the hazard posed by the utility.
- Observing the operation to ensure that the operator stops operations if utilities are observed.
- Reviewing hand signals and other forms of communication with the operator. Note: hand signals should be as those identified under ANSI, OSHA, or the Corps of Engineers for Crane Hand Signals, or another, equally effective and understood system.
- Properly signaling the operator.
- Stopping the operation immediately if the observer's attention must be diverted even momentarily.

- Stopping the operation immediately if a hand signal or other directive is not followed. Operations will not resume until the observer and operator mutually agree that the reason(s) for not complying with the directive(s) are/is identified and fully corrected.
- Maintaining required records, such as logbook entries, or other, as requested by line management.

Operations/Line Management

The Project Manager (PM) or Site Manager (SM) shall be responsible for:

- Establishing the site culture with the assistance of the FSO that ensures compliance with this FLD, as well as providing the leadership to "do the right thing" whenever unanticipated circumstances arise.
- Providing the necessary resources, including sufficient schedule for compliance with this FLD.
- Designating a Competent Person or ensuring that a subcontractor Competent Person is designated, prior to the start of work – who possesses the qualifications and requisite experience to act in such capacity.
- Discussing intrusive activity liability with the Client prior to the start of work. Best practices for identification of underground utilities must be included with the proposal and/or HASP, as well as WESTON's requirement for Client sign-off (if the Client is the property owner or if the Client selects the drilling/intrusive action location) when identifying specific work locations for intrusive activities. In cases where the client, such as EPA, will or cannot sign off on liability or provide indemnification, discussions with the appropriate client representatives on intrusive activities will be documented in the project file.

  Note: In any 'target -rich" work environment, best practices must include the requirement for potholing/daylighting or careful hand-digging – whenever possible (at least 5 feet below grade) – since these are recognized process es for visually verifying the exact location of underground utilities while minimizing the potential for utility damage.

- **For excavations using aggressive methods in target-rich environme nts**, consideration should be given for establishing an agreement with an Emergency Response Contractor and/or the specific utility owner prior to the start of intrusive activities. This agreement should include specific emergency notification procedures for each utility identified to ensure that timely response can be accomplished in the event of a utility strike.
- Determining/verifying ownership of the property where the intrusive activity will occur, including any easements.

- Contacting all utilities not notified directly by the utility notification center, including those known to local personnel and the property owner.
- Obtaining Profit Center Manager approval for any deviations from this FLD, including best practices, or for addressing any set of circumstances not specifically addressed in this FLD that may place WESTON or its employees at risk.

Environmental, Health, and Safety Personnel

The Field Safety Officer (FSO) shall be responsible for:

- Providing oversight on the implementation of the requirements contained in this FLD.
- Consulting with the PM, SM, Competent Person, and the appropriate Division Environmental, Health, and Safety Manager (DEHSM) (or Corporate EHS) on underground utility issues.
- Acting as the Competent Person or Observer as necessary and qualified.

Project-Employees

- Be familiar with the Best Practices and requirement contained in this FLD.
- Comply with all company Environmental health, Safety and Security policies.
- Have knowledge of the hazards associated with sub-surface intrusive activities.

Definitions

Aggressive Methods

The use of mechanized equipment such as (but not limited to) excavators, backhoes, drill rigs, directional drilling, Geoprobe operations (including all direct push techniques), or road saws.

Buffer Zone

As defined in this procedure, the area around a utility where only non-aggressive excavation methods may be utilized, unless specific conditions are met.

The definition cited above, and the excavation requirements and restrictions associated with it, will vary depending on the particular state regulations. WESTON requires the imposition of a **three-foot** Buffer Zone on all sides of the utility as measured from the outside edges of the utility, both horizontally and vertically. State and/or local buffer zone requirements must be verified by consulting the applicable state regulations in the event buffer zones greater than three feet are required.

The term “Buffer Zone” may be referred to as the “Tolerance Zone”, “Safety Zone”, or “Approximate Location of Underground Utilities” in some jurisdictions.

Competent Person

A Competent Person has the ability to recognize hazards associated with underground utilities and the authority to stop or direct operations to ensure the safety of personnel and conformance with this procedure. The Competent Person has an underst anding of this procedure, and the "One -Call" system requirements for the jurisdiction where excavation is occurring. The Competent Person must be capable of notifying One-Call agencies and maintaining and tracking One-Call Locate Numbers. Additionally, the y must have knowledge of methods and work practices for excavation work and the identification , avoidance, and protection of underground utilities.
The designation of a Competent Person will be made by the Site Manager (SM) or Project Manager (PM) and documented in the site-specific Health and Safety Plan (HASP) or attachment to the HASP. Each WESTON Competent Person is required to successfully complete WESTON 's internal training program on the use and application of this FLD and possess appropriate and relevant field experience.
The names of Subcontractor Competent Persons will be documented in the Site-Specific *Subcontractor Acknowledgment: Supervisor Personnel, Competence of Personnel, and Task Understanding* form. Subcontractor Competent Persons will be expected to follow this FLD or their compan y's procedures, whichever is more restrictive.

Damage

Damage may be considered as any undesired impact or unanticipated removal of support from an underground utility as a result of excavation or demolition. Damage may be as simple as minor contact (by any means) resulting in displacement of protective coating. The utility owner must be contacted regarding any damage or question of damage.

De-Energize

As applicable to a utility, to physically eliminate and/or prevent the presence, transmission, flow, or release of energy or materials which may cause harm to personnel or property.

Excavation (Intrusive Activity)

An operation using mechanized equipment for the purpose of movement or removal of earth, rock, or the materials in the ground, including but not limited to: digging, blasting, augering, test boring, drilling, pile driving, directional drilling, grading, plowing-in, hammering (including hammer-drill soil gas sampling tube installation), pulling-in, jacking-in, trenching, tunneling, structural demolition, milling, scraping, tree and root removal (grubbing), and fence or sign post installation. Note that in some States or jurisdictions, excavation may include hand augering or use of other hand tools.

Jurisdiction

The Authority having legal jurisdiction for establishing and/or enforcing regulations and requirements for notification of excavation activities and associated identification and marking of underground utilities. In the United States, the States have jurisdiction, and most consider the regulations applicable when excavation is to be performed in any location, including any public or private way, any company right-of-way or easement, or any public or privately owned land or way. Note: One caveat to remember – Jurisdiction may flow to the "owner" on private or government -owned property because the State One-Call Agencies may not clear utilities on such facilities.

Note that easement boundaries may require differing methods for compliance assurance. Railroads and certain above ground utilities have easements that require specific procedures for excavation (including shoring and shielding of both the utility as well as for the track and/or poles). In these cases it may be required that an inspector or representative of the railroad or utility is present at all phases of the activity.

Locate

To indicate the existence of a utility by establishing a mark through the use of flags, pins, stakes, paint, or some other customary manner, that *approximately* determines the location of a line or facility.

Locate Request

Formal/Active communication between an entity performing intrusive activities and a utility marking agency (One-Call, etc).

Non-Aggressive Methods

Non-Aggressive methods involve the use of manual methods such as hand digging with shovels or by potholing or daylighting methods.

Observer

The person assigned to visually monitor and, as needed, signal the operator during mechanized intrusive activity when the activity is occurring within three feet of the outside edge of the buffer zone. The observer remains in close communication with the equipment operator(s) and will stop the activity if needed.

One-Call Agency

An entity that administers a system through which a person can notify owners/operators of underground lines or utilities of the intent to perform intrusive activities in proposed public access areas. **It is important to note that not all underground utility owners may be required to join the One-Call system. Additionally, some underground utility owners may not comply with State registration requirements.**

The SM or Competent Person is responsible to determine additional utilities that may need to be contacted individually.

Positive Response

Verification prior to the intrusive activity, to ensure that all contacted (typically via the One-Call Agency) owner/operators have located and marked the underground utilities. The SM or Competent Person is responsible to determine/verify ownership of the property where the intrusive activity will occur, including any easements.

Potholing or Daylighting

The practice of exposing an underground facility by safe, *non-aggressive* excavation methods in order to determine the precise horizontal and vertical position and orientation of underground lines or utilities. potholing or daylighting are terms used to describe the excavating of buried facilities using an air or water "knife" coupled with vacuum excavation that expos es underground utilizes to the "daylight" – a positive and safe means of identification and confirmation of exact **UTILITY LOCATION.**

Target Rich Environment

Areas where multiple utilities are known or suspected of being located, areas where utility locations are in question and/or difficult to obtain information on, or areas with known or suspect high-risk utilities are known as target-rich environments.

Note: Military Bases (active or inactive) are to be considered "Target Rich Environments".

Underground Utility

An underground or submerged conductor, pipe, or structure used in transporting or providing electric, communications service, gas, oil or oil product, sewage, storm drainage, water, or other service and appurtenances thereto. As used in this procedure, utility includes all underground appurtenances and structures.

The following are examples of the types of underground utilities that may be present in a given location:

- Natural gas pipelines
- Electric cables
- Water pipelines
- Fiber optic telecommunications lines
- Telephone cable lines
- Steam pipelines
- Gasoline, oil, or other fuels
- Sewer pipelines
- Vents for sewer and gasoline/diesel fueling systems
- Underground Storage Tanks (USTs)
- Abandoned underground structures containing hazardous materials, hazardous wastes, and radioactive materials

Underground Utility Owner

Any person, utility, municipality, authority, political subdivision or other person or entity who owns, operates, or controls the operation of an underground line/facility.

White Lining

The practice whereby the person (in this case WESTON or a Subcontractor) who intends to perform intrusive activities, pre-marks the site with an outline of the area where intrusive activities will occur. This involves the use of white paint, flags, stakes, or a combination thereof to mark the extent of where work is to be performed. The marking may vary depending on what intrusive activities are to be conducted. For example, for general excavation, an areal outline of the excavation shall be marked, while for drilling, the individual boreholes shall be marked. Studies have shown that pre-marking is a practice that does prevent utility contact incidents. Check State or local regulatory requirements to ensure compliance.

Procedure/Best Practices/Requirements

The following sections provide the requirements and recommendations, which are intended to prevent injury to personnel, damage to infrastructure, and associated indirect effects associated with encountering or contacting underground utilities during intrusive work. Underground utilities present multiple potential hazards that must be recognized before and during work which occurs near them, therefore, this procedure is divided into sections addressing underground utility identification and location, working around or near underground utilities, and actions to be taken in the event that underground utilities are encountered or contacted. Hazards that may be presented by underground utilities include explosion and fire, electrocution, toxic exposures, pathogens, and drowning.

Identifying and Locating Underground Utilities

The potential for underground utilities or other subsurface feature (e.g., subsurface min es) must be evaluated as early as possible in the planning phase for any project which involves intrusive activities. The following sections describe various methods for identifying and locating utilities on a site. The *Underground Utilities Locating and Marking Checklist* (Attachment A) and the *Underground Utilities Management Checklist* (Attachment B) must be completed before any activities meeting the definition of excavation are conducted. Attachment A is intended to be used as a guide during the process of locating and marking utilities in the area to be excavated. Attachment B is intended to be used as a guide in the overall process of underground utilities management during the course of the project.

Note: Attachments A and B or their equivalents must be used to document compliance with this FLD and will be subject to audit.
Prior to excavation all underground utilities must be located and identified by at least two of the following:

- The Utility Owner
- The Property Owner
- A Private or Public Utility Locating Service
- Review of the most current utility drawing, maps or other available records by an approved WESTON Competent Person

- Use of utility locating technology by a WESTON Competent Person or subcontractor – this includes the use of potholing or d aylighting in a "target -rich" work environment or whenever a full clearance (without restrictions) cannot be obtained from a utility locating service.

As an aid in determining the potential for or existence of utilities follow the criteria outlined in Attachment C (Utilities Research Options).

Pre-Planning and the Site HASP

The site-specific HASP developed for the project must:

- Identify the location and types of underground utilities that are believed to be present on the site.
- Reference this procedure (FLD 34), and describe how it will be implemented on the project.
- Contain an AHA in which the hazards associated with underground utilities are identified, as well as the measures used to control them.
- Contain any site or contract-specific requirements (e.g., Corps of Engineers, EM 385-1-1, Section 25) that may be applicable.
- Contain clear and concise procedures to be followed in the event that contact with underground utilities occurs.
- Address underground utilities and potential associated scenarios in the emergency response section of the HASP.

"One-Call" Locating and Marking Services

Every state has utility marking service programs that have various names such as "One -Call", "Dig-Safe", "Call-Before-You-Dig", "Dig-Safely", and many others. These services will identify the types and locations of any utility that may exist in an area to be excavated, as long as the property is in the public domain.

- The appropriate One-Call service for the jurisdiction where the project is located must be contacted prior to beginning excavation work. The One-Call Agency should be given as detailed a description of the property as possible; address, cross street, utility pole numbers, physical description, etc.
- Notification to the One-Call service shall allow sufficient lead-time for the Agency to mark the utilities before excavation begins. The lead times vary, but range from two to ten days, depending on the state of jurisdiction.

- In the event the State or Local O ne-Call service number is in question call "811" (the Federal Call before You Dig Number) for access to the appropriate locator service.
- A complete listing of One-Call agencies and telephone numbers for all states is available in the *"One- Call and State Law Directory"*, which can be accessed on the Internet at: www.excavationsafetyonline.com/esg/guidePDFs/2012_2012_ESG_BS_45:51.pdf
- Once notified, the One-Call Agency will provide the contractor with a unique "locate number" or "reference number". This reference number must be kept in the project files by the Competent Person or designee. Additionally, the reference numbers have expiration dates, which may vary depending on the particular One-Call Agency. The valid period of the locate number and required renew notification date shall be requested from the One-Call Agency.
- On a project with multiple contractors, each contractor must request a separate locate number. Under no circumstances will any other contractor or entity be allowed to "work under our locate number". Subcontractors to WESTON may excavate under the locate number secured by WESTON, provided that they are excavating within the area which was previously white-lined by WESTON and subsequently marked. **However, the One-Call Agency must be contacted and notified of this arrangement so that the subcontractor can be recorded as working under the existing locate number.** If a WESTON subcontractor will be excavating in an area not white-lined by WESTON, then the WESTON subcontractor must request a new locate. **Note: State and local requirements must be checked for local application of this procedure.**
- The area where work is to be performed shall be white-lined before the locating service goes to the site.
- It is good practice to arrange a pre-excavation meeting at the project site with the personnel performing the utility location and marking. This meeting will facilitate communications, coordinate the marking with actual excavation, and assure identification of high-priority utilities.
- The One-Call Agency should provide the identities of the utility owners that will be notified of the locate request. This information shall be recorded on the Underground Utilities Locating and Marking Checklist (Appendix A) and maintained in the project files. The contact person and phone number for each utility owner shall also be recorded. ***Note that all utility owners are not members of the One-Call system.*** This does not eliminate the need to contact a non-member owner if you have knowledge or suspect that excavation will impact their utility.
- The utility owners should provide a "positive response" relative to the locate r equest, which can consist of two types of action by the utility owner. The facility owner or operator is required to 1) mark its underground utilities with stakes, paint, or flags, or 2) notify the excavator that the utility owner/operator has no underground utilities in the area of the excavation.

- The positive responses shall be recorded on the Underground Utilities Locating and Marking Checklist (Attachment A) and crosschecked with the list of utility owners that the One-Call Agency stated they would notify. If it is discovered that a utility owner has not provided a positive response, then the One-Call Agency must be notified.
- Excavation shall not be conducted until positive responses have been received from all utility owners identified by the One-Call Agency as having underground utilities on the property.
- Before beginning excavation, the excavator must verify that the location marked was correct, and the distinct, color-coded markings of all utility owners are present.
- Examine the site to check for any visible signs of underground utilities that have not been located and marked such as pedestals, risers, meters, warning signs, manholes, pull boxes, valve boxes, patched asphalt or concrete pavement, areas of subsidence, fresh sod or grass, lack of grass or vegetation, and new trench lines.
- The markings placed by the utility owners should be documented by WESTON using a still, digital, or video camera, whenever practical and reasonable. The photo-documentation shall be maintained with the project files.
- The markings placed by the utility owners or marking services typically follow the American Public Works Association Uniform Color Code as described in ANSI Standard Z 535.1. This code follows:

American Public Works Association Uniform Color Code

Red		Electric Power Lines, Cables, Conduit
Orange		Communications, Telephone, Cable TV
Yellow		Gas, Oil, Steam, Petroleum or Gaseous Materials
Green		Sewers and Drains
Blue		Potable Water Systems
Purple		Reclaimed Water, Irrigation, Slurry Lines
Pink		Temporary Survey Markings
White		Proposed Excavation

Note: Unless otherwise specified in the utility clearance, such clearance will not be considered valid after 30 days from the date it was issued.

Private Utility Locating and Marking Services

- **One-Call agencies arrange for the identification and marking of underground utilities only on public property, up to the point of contact with private property.** In the event that activities are to be conducted on non-public properties, the presence, location, depth, and orientation of all underground utilities shall be ascertained through records review, including any site plot plans, utility layout plans, and as-built drawings available from the property owner, as well as through interviews with knowledgeable personnel associated with the property (See Attachment C). Additionally, for excavations using aggressive methods in target-rich environments or other situations where utility locations are in question, the information gathered from these sources shall be verified by physical detection methods (non-aggressive), performance of a geophysical survey, or by procuring the services of a private utility locating and marking service. If any detection methods are to be self-performed, the requirements within this FLD must be followed.

Self-Performance of Utility Locating and Marking

The techniques and instruments used to locate and characterize underground utilities can be extremely complicated and difficult to use effectively. Additionally, interpretation of the data generated by this instrumentation can be difficult. The utility marking services, as previously described are staffed by well-trained, experienced professionals who perform locating activities on a regular basis. For these reasons, it is most desirable that these professional services are used for utility location and marking on projects.

- In some instances on private property or in other areas not served by One-Call agencies (e.g., long-term projects where excavation is a primary task, and the presence of underground utilities is extensive) it may be prudent to self-perform locating and marking activities.
- If locating and marking is to be self-performed, all personnel using instrumentation will be trained on the use of the equipment that will be used, and the interpretation of the data.
- There are a variety of locating methods which may be utilized for self-performance of utility locating as categorized below:
  - Magnetic field-based locators or path tracers
  - Buried electronic marker systems (EMS)
  - Ground penetration radar-based buried –structure detectors
  - Acoustics-based plastic pipe locators
  - Active probes, beacons, or sondes for non-metallic pipes
  - Magnetic polyethylene pipe
- Before self-performing any underground utility locating on a project, approval must be obtained from the appropriate WESTON DEHSM or the Corporate EHS Director.

Working Near or Around Underground Utilities

After the site has been properly evaluated for the presence of aboveground utilities, underground utilities, and other appurtenances, intrusive activities may begin. Because there is no perfect way of eliminating the hazards presented by underground utilities, an effort must be made to perform the tasks following the direction and guidance as described by the following best practices that should be implemented during the execution of the project.

Work Site Review

Before beginning intrusive activities, a meeting shall be held between all members of the project team. This shall consist of a review of the marked utility locations with the equipment operators, observers, laborers, etc.

Preservation of Marks

During excavation, efforts must be made to preserve the markings placed by the utility owners until they are no longer required. If any markings are obliterated, the One-Call Agency must be contacted for re-marking. No intrusive activities are to take place if markings are not visible.

Excavation Observer

Whenever intrusive operations are being conducted within three feet of the edge of the buffer zone, an observer must be assigned to monitor the activities. The observer will be designated each day, and a review of hand signals and other forms of communication between the observer and operator will be conducted. The directives of the observer will be followed precisely and immediately by those operating equipment.

Excavation within the Buffer Zone

Mechanical means of excavation may not be used within 36 inches (see Buffer Zone) of any marked or suspect utility until the utility has been exposed. Mechanical methods may be used, as necessary, for initial penetration and removal of pavement, rock or other materials requiring use of mechanical means of excavation provided a spotter is used. Once the underground utility has been exposed, further excavation must be performed, employing reasonable precautions to avoid damage to the utility, including but not limited to any substantial weakening of structural or lateral support, or penetration or destruction of the utility or its protective coatings. For purposes of this section, "mechanical means of excavation" means excavation using any device or tool powered by an engine except air vacuum or like methods of excavation.

A request to utilize aggressive excavation methods in the buffer zone may be made if:

- There is no other appropriate and reasonable alternative to using aggressive methods in the buffer zone; and
- The utility has been de-energized (and purged if necessary), verified as de-energized, and locked-out; or
- The depth and orientation of the utility has been adequately and visually determined through the use of non-aggressive methods such as air/hydro/vacuum excavation, potholing, probing, hand-digging, or a combination thereof; and
- For utilities containing electrical energy, the depth of the existing water table is below the location of the utility; and
- Request for the exemption has been submitted to the appropriate DEHSM and Profit Center Manger for approval.

The following conditions will apply to this request:

- Aggressive methods may be used in the buffer zone only to the extent allowed by the applicable state or other jurisdictional regulations.
- Appropriate physical protection measures for exposed utilities shall be implemented to eliminate the potential for equipment contact with utilities.
- The extent of the project excavation area to be covered by the exemption request must be specified in the request for exemption.
- When evaluating the use of aggressive excavation methods in the buffer zone, the DEHSM will consider the type of utility involved and the associated risk potential. Based on this evaluation, the Profit Center Manager and/or DEHSM may impose further conditions and requirements. Even if the above exemption conditions are met, the DEHSM has authority to deny the request.

Unless exempted according to the above provisions of this procedure, only non-aggressive methods may be used within the buffer zone. These methods are used in order to prevent mechanical contact with underground utilities, which could result in damage to the utility and create the potential for personal injury and property damage. Following are examples of non-aggressive excavation methods:

- Hand-digging
  - Non-conductive hand tools must be used when digging within the buffer zone surrounding underground electrical utilities.

- If conductive hand tools must be used near electrical lines, then the FSO and/or DEHSM shall be consulted to determine additional requirements relative to safe electrical practices, procedures, and equipment.

- Hydro-excavation (water pressure).
- Air excavation (air pressure).
- Vacuum extraction (soil excavation/removal).
- Air excavation/vacuum extraction combination.
- Aggressive methods may be used for the removal of pavement over a utility, if allowed by the state regulations.

Protection of Underground Utilities

It is very important that consideration be given to the protection of underground utilities when performing adjacent intrusive activities. This is necessary not only to prevent physical damage and associated indirect effects, but also to prevent the potential for injury to employees and the public.

- When using aggressive excavation methods within the buffer zone around exposed underground utilities, physical protection must be used as required by OSHA in 29 CFR 1926.651. Basically, this involves creation of a physical barrier between the mechanized operation and the utility. The following are some possible types of physical protective measures:
  - Heavy timbers, similar to swamp or crane mats.
  - Sheets of plywood.
  - Blasting mats.
- Once exposed, underground utilities no longer have the support provided by surrounding soil and may need to be physically supported to prevent shifting, bending, separation, or collapse, which could result in damage to the utility, and possibly personnel. Following are suggested support methods:
  - Timber shoring underneath the utility.
  - Timbers or girders over the top of the excavation fitted with hangers that support the utility.
  - Design by a Professional Engineer for complicated or large applications.
- Utilities must also be protected from objects that may fall into the excavation such as rocks and equipment. This can be accomplished by following these guidelines:
  - Cast spoils as far away from the excavation as possible. Excavated and loose materials shall be kept a minimum of two feet from the edge of excavations.
  - Relocate large rocks, cobbles, and boulders away from the excavation and sloped spoils piles.

- When vehicles and machinery are operating adjacent to excavations, warning systems such as soil berms, stop logs or barricades shall be utilized to prevent vehicles from entering the excavation or trench.
- Scaling or barricades shall be used to prevent rock and soils from falling into the excavation.
- Barriers shall be provided to prevent personnel from inadvertently falling into an excavation.

De-Energizing Utilities

Utilities can carry many types of potential energy, including electricity, flowing liquids, liquids under pressure, or gasses under pressure. A release may happen if a utility conveyance is compromised and could result in personal injury, property damage, and other indirect effects. If the white lines of the proposed excavation area overlaps or extends into the buffer zone of a known underground utility, then if at all possible, that utility should be de-energized to physically prevent the transmission, flow, or release of energy. Conversely, if the buffer zone of the known utility lies outside of the white-lined, proposed excavation area, then de-energizing is not required.

- The owner of the utility shall be contacted to determine the feasibility and methodology of de-energizing the utility. Plenty of lead-time should be provided for this since it may take utility companies weeks to de-energize some utilities.
- Depending on the utility and the material being conveyed, isolation points which may be suitable for de-energizing include but are not limited to the following:
  - Electrical circuit breakers
  - Slide gate
  - Disconnect switches
  - Piping flanges
  - Other similar devices
- When utilities are de-energized, it must be verified by demonstration. This can be accomplished by methods such as, testing equipment, switching on a machine or lighting, or opening a valve. For any current-carrying electrical equipment, such as cables or electrical panels, successful de-energizing must be certified through the use of appropriate electrical testing equipment and qualified personnel.
- Whenever a utility is de-energized, a means of ensuring that the energy isolation device and equipment cannot be operated until the device is removed must be provided.
- When de-energizing and locking out of utilities is practiced, the provisions of FLD 42 Lockout/ Tagout shall be followed, as applicable.

Damage Discovery

During excavation, utility damage may be discovered which is pre-existing or otherwise not related to a known contact. Disclosure to the utility owner is very important because the possibility of utility failure or endangerment of the surrounding population increases when damage has occurred. The utility may not immediately fail as a result of damage, but the utility owner or operator must be afforded the opportunity to inspect the utility and make a damage assessment and effect repairs if necessary. The following guidance applies:

- Observe and photograph the utility from a safe distance and determine if there is damage. Damage would be all breaks, leaks, nicks, dents, gouges, grooves, or other damages to utility lines, conduits, coatings, or cathodic protection systems.
- The owner of the affected utility must be contacted immediately.
- The One-Call Agency or private location service must be contacted immediately.
- A Notification of Incident (NOI) Report will be used to document such a discovery.

Encountering Unexpected Underground Utilities

It is possible that underground utilities will be encountered in locations that have previously been "cleared" of having underground utilities by the locating service, or are found outside of the area, which has been marked as having underground utilities. In either case, if this occurs, the following applies:

- Site personnel must be warned and moved to a safe location; equipment engines and ignition sources should be turned off, if possible, as the operator is exiting his/her equipment.
- Intrusive activities must be stopped.
- The owner of the affected utility must be immediately contacted.
- The One-Call Agency or private location service must be contacted immediately.
- The PM, SM, and FSO must be notified.
- No further intrusive activities may be conducted until:
  - The One-Call Agency/private location service and/or the subject utility owner visit the site;
  - Identification of the utility owner and the type of material/energy being conveyed by the utility has been made; and
  - The orientation and depth of the subject utility has been determined and suitably marked.
- A NOI Report must be completed. The report should be accompanied by photographs clearly showing the marking(s), and the actual location, with a distance gauge to document how far off the mark the utility was encountered.

Contacting Underground Utilities

If excavation or other equipment being used for intrusive activities makes contact with an underground utility, the following guidelines apply:

- Site personnel must be warned and moved to a safe location; equipment engines and ignition sources should be turned off, if possible, as the operator is exiting his/her equipment.
- Intrusive activities must be stopped immediately.
- Observe the utility from a safe distance and determine if there is damage. Damage would be all breaks, leaks, nicks, dents, gouges, grooves, scratched coatings, cathodic protection compromise, material leakage, obvious electrical energy.
- Move all personnel to the evacuation meeting point as described in the HASP.

  EXCEPTION: *If an electrical line has been contacted and it is your belief that equipment (such as an excavator) is electrically energized, do not approach the equipment. Order the operator to remain in the equipment until emergency personnel can de-energize the source (unless the equipment is on fire, at which time the operator should jump off of the vehicle and shuffle along the ground to a safe area). Shuffling is required because current flows outward through the soil in a ripple pattern called a power gradient, creating a pattern of high and low potential, Shuffling decreases the chance that these gradients could be bridged, causing current to flow through the body, resulting in electrocution.*
- Secure the area to prevent the public from entering.
- Contact emergency responders as specified in the HASP.
- Immediately contact the One-Call Agency or if known, the utility owner.
- Notify the PM, SM, FSO and DEHSM.
- No further intrusive activities may be conducted until:
  - The utility owner inspects the scene and after repairs, verifies that all danger has passed.
  - The orientation and depth of the subject utility has been determined and suitably marked.
  - Permission from the emergency responders to resume work has been given.
- A WESTON NOI Report must be completed. The report should be accompanied by photographs clearly showing the marking(s), and the actual location, with a distance gauge to document ho w far off the mark the utility was encountered.
- State and Local regulations must be reviewed to determine if reporting to any additional agencies is required.

Training

Training shall occur prior to exposure of underground utility-related hazards or operation of subsurface intrusive equipment and shall include co-workers working in the immediate vicinity of the equipment/intrusive activity that have the same exposure.

All training shall be documented.

ATTACHMENTS

Attachment A – Underground Utilities Locating and Marking Checklist

Attachment B – Underground Utilities Management Checklist

Attachment C – Utilities Research Options

Informational Addendum - Overview of Underground Utility Detection Methods

ATTACHMENT A
UNDERGROUND UTILITIES LOCATING AND MARKING CHECKLIST

To be Completed by PM and/or "Competent Person"

Complete Form as Location/Marking Progresses and Maintain in Site Files

PROJECT INFORMATION:	**Location:**
Project Name:	Task/Activity:
WESTON Competent Person:	Start Date of Work:
WESTON Subcontractor: ☐ No ☐ Yes:	Private Locating Service Required: ☐ Yes ☐ No
Subcontractor Competent Person:	If Not, Explain:
Property Owner:	
NOTIFICATION:	
Locating Service Name:	Locating Service Tel. Number:
Date Locating Service Notified:	Locate Ticket Number:
Address of Property to be Marked:	Locate Ticket Expiration Date:
Nearest Intersecting Street:	
Are There Any Utilities on the Properties That the Locating Service Will Not Contact? ☐ Yes ☐ No Specify:	

Enter Utility Information in Table 1 Below. In Addition to Utility Locating Services, Consult Client, Utility Owners, Drawings, Facility Personnel, Maintenance Personnel, Municipalities (See Appendix C).

Table 1. On-Site Utility Information

Name of Utility Company	Type of Utility	Color Code	Utility Present On-Site?	Emergency Phone Number	Date Marks Completed
	Electric	RED			
	Communications, Phone, CATV	ORANGE			
	Gas, Oil, Steam, Petroleum	YELLOW			
	Sewers, Drains	GREEN			
	Potable Water	BLUE			
	Reclaimed Water, Irrigation	PURPLE			
	Temporary Survey Markings	PINK			
To be performed by excavator prior to utility mark-out.	Proposed Excavation	WHITE			

White-Lining Completed?

☐ No Explain: ____________________ ☐ Yes: Date: ___________ By Whom? ______________________

LOCATING AND MARKING:

Have All Utilities Identified in Table 1 Been Marked?

☐ Yes ☐ No (If No, Contact Locating Service for Resolution)

Problem(s) With Markings?

☐ Yes ☐ No ☐ No Marks ☐ Incorrect Location ☐ Too Wide

☐ Other: ___________________________ ☐ Not All Utilities Marked Per Table 1 (notify marking service)

Measurements Taken: ☐ Yes ☐ No

Documentation of Marks: ☐ Photos ☐ Video ☐ Other: ______________________________________

EXCAVATION:

Utilities Accurately Marked? ☐ Yes ☐ No

If no, describe: ______________________________

Were Unmarked or Miss-Marked Utilities Encountered? ☐ Yes ☐ No

If Yes, Specify: ______________________________

Locating Service Notified? ☐ Yes ☐ No

Will Excavation Continue Past Locate Number Expiration? ☐ Yes ☐ No

If Yes, Locate Number Renewed? ☐ Yes ☐ No New Expiration Date: ___

Additional Problems or Concerns - Specify: ______________________________

Form Completed By:	Signature:	Date:

ATTACHMENT B
UNDERGROUND UTILITIES MANAGEMENT CHECKLIST
Weston Solutions, Inc.

To be Completed by PM and/or "Competent Person"

Complete Form as Project Progresses and Maintain in Site Files.

PHASE		TASK	YES	NO	NA	COMMENTS Required if Response is No or NA. (Reference Item Number)
Pre-Planning	1	Excavation/Best Practices in Work Scope?				
	2	Underground Utilities Identified?				
	3	Competent Person Assigned?				
	4	Has a Copy of the Applicable State Regulations Been Obtained, Read, Understood?				
	5	EHS Plan Addresses Underground Utilities? (AHAs, Contingency Plan, State Regulations Appendix)				
Identifying, Locating and Marking	6	Locating and Marking Checklist Initiated? (Attachment A)				
	7	Identification and Address of Property Determined, Including Nearest Intersection?				
	8	One-Call Agency Contacted?				
	9	Additional Locating and Marking Required on Property? (One-Call agency marks to public property line only)				
	10	Additional Marker/Locator Identified?				
	11	Additional Marker/Locator Qualified?				
	12	Weston Self-Performing Location and Marking?				
	13	If Yes to 12 Above, Approval From Division EHS Manager?				

	Weston Solutions, Inc.	Doc No:	FLD34-0712
		Initial Issue Date	July 2012
		Revision Date:	Initial Version
FLD 34 Underground Utilities		Revision No.	0
		Next Review Date:	Annual Review
Preparation: CEHS	Authority: CEHS Director / Issuing Dept: CEHS	Page:	Page 25 of 33

PHASE		TASK	YES	NO	NA	COMMENTS Required if Response is No or NA. (Reference Item Number)
Identifying, Locating and Marking	14	Area of Excavation "White-Lined" by WESTON?				
	15	WESTON Present When Markings Completed?				
	16	All Utilities Marked? (Refer to Attachment A, Table 1)				
	17	All Markings Photo/Video Documented?				
Identifying, Locating and Marking – Continued	18	Area Checked for Signs of Previous Excavation? (Subsidence, new grass, patching, etc)				
	19	All Applicable Information Recorded on Attachment A?				
	20	Multiple Contractors Excavating On-Site?				
	21	Separate Locate Requests for All Contractors?				
	22	WESTON Subcontractors Excavating in WESTON White-Lined Area(s)?				
	23	If Yes to 22 Above, One-Call Agency Contacted to Determine if WESTON Subcontractor Can be Added to Existing Locate Ticket?				
Excavation Activities	24	Meeting and Site Walkover Conducted with Project Personnel? (Managers, Equipment Operators, Laborers, Competent Person, Excavation Observer, etc)				
	25	AHA and HASP Review Conducted With Personnel?				
	26	Do Site Activities Have Potential to Obliterate Utility Markings?				

PHASE		TASK	YES	NO	NA	COMMENTS Required if Response is No or NA. (Reference Item Number)
Excavation Activities	27	If Yes to 26 Above, Have Provisions Been Made to Preserve Markings?				
	28	Has an Excavation Observer Been Designated to Monitor Excavation When Occurring within 3 Feet of the Buffer Zone?				
	29	Have Operator and Observer Reviewed Commands and Signals?				
	30	Has WESTON-Required Buffer Zone Been Marked on Either Side of Markings Placed by Locator?				
Excavation Within Buffer Zone	31	Is Excavation Within The Buffer Zone Absolutely Necessary?				
	32	If Yes to 31 Above, Can Non-Aggressive Methods Be Used For Excavation In The Buffer Zone? If Yes, Identify Appropriate Non-Aggressive Methods.				
	33	If No to 32 Above, Has a Buffer Zone Exemption Request Been Approved? If No, then Aggressive Methods May Not Be Used in The Buffer Zone.				
	34	If Yes to 33 Above, Has the Utility Been De-Energized, Purged, Verified/Tested, and Locked-Out? Or, Has The Depth and Orientation of the Utility Been Adequately and Visually Determined Through The Use of Non-Aggressive Methods?				

PHASE	TASK		YES	NO	NA	COMMENTS Required if Response is No or NA. (Reference Item Number)
Excavation Within Buffer Zone - Continued	35	If Yes to 34 Above, Have All of The Following Conditions Been Met? For Utilities Containing Electrical Energy, Is The Depth of The Water Table Below The Depth of The Utility? Have Regulations Been Consulted to Determine Specific State Requirements Relative to Excavating in The Buffer Zone? Have Appropriate Physical Protection Measures Been Implemented to Prevent Equipment Contact With Utilities and to Prevent Damage to Utilities? If No to Any of The Above Conditions, Then Only Non-Aggressive Excavation Methods May Conducted in The Buffer Zone, Since The Conditions of The Exemption Have Not Been Satisfied.				
Working Around Exposed Utilities	36	If Necessary, Have Provisions Been Made to Support the Utility During Work Activities?				
	37	Have Spoils Been Placed as far Away From the Excavation as Feasible?				
	38	Has the Utility Been De-Energized? (If Any Portion of the Buffer Zone around a Utility is Inside of the White-Lined Area)				
	39	Has the Isolation Point for the De-Energized Utility Been Physically Locked-Out?				
	40	If No to 39 Above, Has a Spotter Been Assigned to Monitor Isolation Point?				
	41	If Yes to 40 Above, Does the Spotter Have Adequate Communications? (Radio, Telephone, etc)				

	Weston Solutions, Inc.	Doc No:	FLD34-0712
		Initial Issue Date	July 2012
		Revision Date:	Initial Version
FLD 34 Underground Utilities		Revision No.	0
		Next Review Date:	Annual Review
Preparation: CEHS	Authority: CEHS Director / Issuing Dept: CEHS	Page:	Page 28 of 33

PHASE		TASK	YES	NO	NA	COMMENTS Required if Response is No or NA. (Reference Item Number)
Working Around Exposed Utilities - Continued	42	Has the Isolation Point Been Tagged?				
Damage Discovery	43	Has Pre-Existing Damage to a Utility Been Discovered During Excavation?				
	44	If Yes to 43 Above, Has the One-Call Agency and/or Utility Owner Been Notified?				
	45	If Yes to 43 Above, Have Photographs Been taken?				
Encountering or Contacting Underground Utilities	46	Have Utilities Been Encountered in Locations That Have Not Been Marked?				
	47	If Yes to 46 Above, Has the One-Call Agency or Other Locating Service Been Contacted?				
	48	If Yes to 46 Above, Has the PM and Appropriate DSM Been Notified?				
	49	If Yes to 46 Above, Has a WESTON Notification of Incident (NOI) Report Been Completed? (Include Photographs)				
	50	Have Excavation Equipment Come In Contact With Underground utilities?				
	51	If Yes to 50 Above, Were Intrusive Activities Immediately Curtailed?				
Encountering or Contacting Underground Utilities – Continued	52	If Yes to 50 Above, Has a Damage Determination Been Made From a Safe Distance?				
	53	If Yes to 50 Above, Has the Area Been Secured?				
	54	If Yes to 50 Above, Have Emergency Responders Been Notified?				

	Weston Solutions, Inc.	Doc No:	FLD34-0712
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FLD 34 Underground Utilities		Revision No.	0
		Next Review Date:	Annual Review
Preparation: CEHS	Authority: CEHS Director / Issuing Dept: CEHS	Page:	Page 29 of 33

PHASE		TASK	YES	NO	NA	COMMENTS Required if Response is No or NA. (Reference Item Number)
	55	If Yes to 50 Above, Has the Locating Agency and/or Utility Owner Been Notified?				
	56	If Yes to 50 Above, Have State and Local Reporting Requirements Been Met?				
	57	If Yes to 50 Above, Were Intrusive Activities Curtailed Until Inspection From Utility Owner, Orientation and Depth of Utility Was Determined and Marked, Permission From Emergency Responders Given?				
	58	If Yes to 50 Above, Has a WESTON Notification of Incident (NOI) Report Been Completed? (Include Photographs)				

CHECKLIST COMPLETED BY:

NAME SIGNATURE DATE

NAME SIGNATURE DATE

ATTACHMENT C
UTILITY RESEARCH OPTIONS

In the course of determining and verifying underground utility location it is expected that a minimum of two resources will be used. As a means of assisting the search for sources, the following is offered.

Records Sources:

- ☐ Utility Section of the State DOT or other Public Agency
- ☐ One-Call Center
- ☐ Public Service Commission or similar organization
- ☐ County Clerks Office
- ☐ Landowner
- ☐ Internet or Computer database
- ☐ Visual Site Inspection
- ☐ Utility Owner

From the Above Collect:

- ☐ Previous construction plans in the area
- ☐ Conduit maps
- ☐ Direct-Buried Cable records
- ☐ Distribution maps
- ☐ Service record maps
- ☐ As-built and record drawings
- ☐ Field notes
- ☐ County, city, utility owner or other geographic information system database
- ☐ Circuit diagrams
- ☐ Oral histories (current or previous employees, residents)

Review Records and Obtain Information For:

- ☐ Indications of additional and/or other available records
- ☐ Duplicate information that lends credibility to data
- ☐ Any additional need for clarifications from owners/others

Informational Addendum - Overview of Underground Utility Detection Methods

Induction Utility Locators

Induction utility locators operate by locating either a background signal or by locating a signal introduced into the utility line using a transmitter. There are three sources of background signals that can be located. A utility line can act like a radio antenna, transmitting electromagnetic signals that can be picked up with a receiver. AC power lines have a 50HZ signal associated with them. This signal occurs in all active AC power lines regardless of voltage. Utilities in close proximity to AC power lines or used as grounds may also have a 50HZ signal that can be located with a receiver. A signal can be indirectly induced onto a utility line by placing the transmitter above the line. Through a process of trial and error, the exact above position can be determined. A direct induced signal can be generated using an induction clamp. The inductor clamp induces a signal on specific utilities. This is the preferred method of tracing, where possible. By virtue of the closed loop, there is little chance of interference with the resulting signals. When access can be gained to a conduit, a flexible insulated trace wire can be used. The resulting signal loop can be traced. This is very useful for non-metallic conduits. Finally, these signals can be located horizontally on the surface using a receiver. The receiver is moved across the estimated location of the utility line until the highest signal strength is achieved. This is the approximate horizontal location of the utility. The receiver is then rotated until minimal signal strength is achieved. This will give the approximate orientation of the utility. Vertical depth, however, derived from this equipment is subject to gross error.

Magnetic Locators

Ferrous Metal or Magnetic locators operate by indicating the relative amounts of buried ferrous metals. They have limited application to locating and identifying utility lines but can be very useful for locating underground storage tanks (UST's) and buried manhole covers or other subsurface objects with a large ferrous metal content.

Electromagnetic Surveys

Electromagnetic survey equipment is used to locate metallic utilities. This method pulses the ground and records the signal retransmitted back to the unit from subsurface metal. Particularly useful for locating metal pipelines and conduit, this device also can help locate other subsurface objects such as UST's, buried foundations (that contain structural steel), and pilings and pile caps (that also contain steel).

Ground Penetrating Radar

Ground Penetrating Radar (GPR) is an electromagnetic method that detects interfaces between subsurface materials with differing dielectric constants (a term that describes an electrical parameter of a material). The GPR system consists of an antenna, which houses the transmitter and receiver; and a profiling recorder, which processes the received signal and produces a graphic display of the data. The transmitter radiates repetitive short-duration EM signals into the earth from an antenna moving across the ground surface. Electromagnetic waves are reflected back to the receiver by interfaces between materials with differing dielectric constants. The intensity of the reflected signal is a function of the contrast in the dielectric constant at the interface, the conductivity of the material, which the wave is traveling through, and the frequency of the signal. Subsurface features which may cause such reflections are: 1) natural geologic conditions such as changes in sediment composition, bedding and cementation horizons, voids, and water content; or 2) man-introduced materials or changes to the subsurface such as soil backfill, buried debris, tanks, pipelines, and utilities. The profiling recorder receives the signal from the antennae and produces a continuous cross section of the subsurface interface reflections, referred to as reflectors.

Depth of investigation of the GPR signal is highly site specific, and is limited by signal attenuation (absorption) of the subsurface materials. Signal attenuation is dependent upon the electrical conductivity of the subsurface materials. Signal attenuation is greatest in materials with relatively high electrical conductivity such as clays and brackish groundwater, and lowest in relatively low conductivity materials such as unsaturated sand or rock. Maximum depth of investigation is also dependent on antennae frequency and generally increases with decreasing frequency; however, the ability to identify smaller features is diminished as frequency decreases.

The various GPR antennas used are internally shielded from aboveground interference sources. Accordingly, the GPR signal is minimally affected by nearby aboveground conductive objects such as metal fences, overhead power lines, and vehicles.
A GPR survey is performed by towing an antenna across the ground along predetermined transect lines. The antennae is either pulled by a person or towed behind a vehicle. Preliminary GPR transects are performed over random areas of the site to calibrate the GPR equipment and characterize overall site conditions. The optimum time range settings are selected to provide the best combination of depth of investigation and data resolution for the subsurface conditions at the site. Ideally, the survey is performed along a pre-selected system of perpendicular or parallel transect lines. The configuration of the transect lines is designed based on the geometry and size of the target and the dimensions of the site. The beginning and ending points of the transect lines and grid intersection points, or nodes, are marked on the ground with spray paint or survey flags. A grid system is used to increase the probability of crossing the short axis of a target providing a more definitive signature in the data. The location of the antenna along a transect line is electronically marked on the cross section at each grid intersection point to allow correlation of the data to actual ground locations. The location of the targets can be marked on the ground surface using spray paint or survey flags.

Acoustic Location Methods
Acoustic location methods generally apply to waterlines. A highly sensitive Acoustic Receiver listens for background sounds of water flowing; (at joints, leaks, etc.) or to sounds introduced into the water main

using a transducer. This method may have good identification results, but can be inaccurate. Acoustics can also being utilized to determine the location of plastic gas lines.

FLD 38 HAND AND POWER HAND TOOLS

REFERENCES

29 CFR 1926 Subpart I
29 CFR 1910 Subpart P
ANSI Standard A10.3-1970, Safety Requirements for Explosive-Actuated Fastening Tools

RELATED FLDs

FLD 06 – Cold Stress
FLD 10 – Manual Lifting and Handling of Heavy Objects
FLD 16 – Pressure Systems: Compressed Gas Systems
FLD 35 – Electrical Safety

INTRODUCTION

Injuries from hand tools are often caused by improper use, using the wrong tool for the job, or from using a defective tool. Workers often assume that they know how to use a common hand tool. Working with something other than the simplest non-powered hand tools shall be performed only by those persons competent or qualified through formal training or documented experience.

Like all tools, hand and power tools must be maintained properly for effective use and safety. This Field Operating Procedure describes general safety guidelines for the four major categories of hand tools: cutting tools, torsion tools, impact tools, and power tools.

The use of any machinery, tool, material, or equipment which is not in compliance with any applicable OSHA 1910/1926 requirement is prohibited. Any tools or equipment identified as unsafe or defective will be "tagged or locked-out." Controls shall be applied rendering the unsafe or defective tool or equipment inoperable. Any damaged or defective equipment shall be removed from its place of operation. Weston shall be responsible for the safe condition of tools and equipment used by employees, including tools and equipment that may be furnished by employees.

Tags shall be used as a means to prevent accidental injury or illness to employees who are exposed to hazardous or potentially hazardous conditions, equipment or operations, which are out of the ordinary, unexpected, or not readily apparent. Tags shall be used until the identified hazard is eliminated or the hazardous operation is completed. Tags need not be used where signs, guarding, or other positive means of protection are being used.

GENERAL SAFETY RULES – APPLICABLE TO USE OF ALL TOOLS

- Tools will be inspected prior to each use. Tools found to be unsafe will be tagged by the inspector "Do Not Use" and either repaired or removed from the site.
- Keep the work area clear of clutter.
- Keep the work area properly illuminated.
- Maintain and keep tools sharpened, oiled, and stored in a safe, dry place.
- Wear ear and eye protection when cutting, sawing, drilling, or grinding.
- Supervisor should instruct everyone using equipment on safe procedures before they use them.
- Inspect tools, cords, and accessories regularly and document any repairs.

- Repair or replace problem equipment immediately.
- Electric power tools must have a 3-wire cord plugged into a grounded receptacle, be double-insulated or powered by a low-voltage isolation transformer, and fitted with guards and safety switches.
- Machine guards must be in-place and not removed during equipment operation.
- Do not alter factory-supplied safety features on tools.
- Install and repair equipment only if you are qualified.
- Use the right tool for the job; for instance, do not use a screwdriver as a chisel or a wrench as a hammer.
- Carry a sharp tool pointed downward or place in a tool belt or toolbox.
- Protect a sharp blade with a shield.
- Store tools in drawers or chests with cutting edge down.
- When using power tools, wear long hair in a protective manner, do not wear jewelry or loose clothing, use safety glasses, respiratory protection, hard hats, etc., as needed/specified by the manufacturer. Note that protective gloves should not be worn when operating powered woodworking tools because of the possibility of the work piece snagging the glove and pulling the hand to the cutting surface.
- All hand-held power-driven tools must be equipped with one of the following: a constant pressure switch that shuts off the power upon release (e.g., circular saws, hand-held power drills, chain saws) or an on-off switch (e.g., routers, planers scrolls saws, jigsaws).
- Never leave a running tool unattended.
- All workers using hand and power tools must be properly trained, and training must be documented.
- Tools of a non-sparking material must be used if fire/explosion hazards exist.
- All fuel-operated tools shall be stopped and allowed to cool prior to being refueled, serviced, or maintained, and proper ventilation provided when used in enclosed spaces.
- Bench grinders shall be properly grounded. Work rests must be kept at a distance not to exceed 1/8 inch from the grinding wheel surface.
- All persons using grinders or abrasive wheels shall use approved eye-protective devices.
- Hand held grinders shall have grinding wheel guards in place during operation.
- Train personnel to recognize that tasks involving lifting, repetitive motion, excess pressure, vibration, awkward positions, and remaining stationary for prolonged periods and work in cold conditions increase the risk of musculoskeletal injury. Procedures for avoiding or minimizing risk include: using mechanical devices for lifting, following procedures in FLD 10 when manual lifting is necessary, using shock absorbing gloves when using vibrating tools, choosing tools that reduce gripping force and align joints in a neutral position or holding tools in an ergonomically neutral position, taking breaks or alternating repetitive jobs, and following procedures in FLD 06.
- Hand tools such as chisels and punches, which develop mushroomed heads during use must be taken out of service and reconditioned by qualified persons or replaced, as necessary.
- Broken or fractured handles on hammers, axes and similar equipment must be replaced promptly.
- Worn or bent wrenches must be replaced.

- Handles designed for use on files and similar tools must be used.
- Jacks must be checked periodically to ensure they are in good operating condition

TORSION TOOLS

Torsion tools are used to grip, fasten, and turn. These include wrenches, pliers, screwdrivers, vises, and clamps. There is a variety of each type of these tools. Selection is very important. Here are a few safety precautions for common torsion tools:

- Wrenches should always be pulled and not pushed. Pushing a wrench can cause a loss of control if there is a sudden release of pressure. A short, steady pull should be used rather than quick, jerky motions. Where available, use a socket wrench instead of an adjustable or open-ended wrench. Socket wrenches are generally easier to control, are more convenient, and are less likely to damage a bolt or nut. When using an adjustable wrench, the pressure should be applied to the fixed jaw
- Pipe wrenches can easily slip on pipes or fittings, causing injury. To prevent slipping, make sure that the pipe or fitting is clean and the wrench jaws are sharp and kept clean of oil and debris.
- Pliers should never be substituted for a wrench. They do not have the same gripping power and can easily slip on a tight object. When using cutting pliers, the object being cut can fly off and cause injury. Wear safety glasses when cutting with pliers.
- Screwdrivers are often misused. They should not be used for prying, or as punches or wedges. These misuses can damage the head of the screwdriver. A dull tip can cause the screwdriver to slip. The tip must be flat at the tip and tapered for a snug fit on the screw.
- When using vises, make sure that the vise is bolted solidly to a base (e.g., work bench). When cutting material in a vise, try to cut as close to the vise as possible to minimize vibration.
- Oil vises regularly.

Screwdrivers

- Most screwdrivers are not designed to be used on electrical equipment. Use an insulated screwdriver.
- Do not hold an object in the palm of one hand and press a screwdriver into it; place the object on a bench or a table.
- Never hammer with a screwdriver.
- Check for broken handles, bent blade, etc.
- Select a screwdriver of the proper size to fit the screw.
- Screwdrivers with a split or splintered handle shall not be used.
- The point shall be kept in proper shape with a file or grinding wheel.
- Screwdrivers shall not be used as a substitute punch, chisel, nail-puller, etc.

Pliers

- Do not use pliers as a substitute for hammers or wrenches.
- Use insulated pliers when doing electrical work.

- Inspect pliers frequently to make certain that they are free of breaks or cracks.
- Pliers shall be kept free from grease and oil and- the teeth or cutting edges shall be kept clean and sharp.
- The fulcrum pin, rivet or bolt shall be snug but not tight.

Wrenches

- Select the correct size of wrench for the job.
- Never use a piece of pipe or another wrench as a wrench handle extension.
- Too much leverage can ruin a tool and cause injury.
- To avoid sudden slips, stand in a balanced position and always pull on the wrench instead of pushing against the fixed jaw.
- Only wrenches in good condition shall be used; a bent wrench, if straightened, has been weakened and shall not be used.
- Watch for sprung jaws on adjustable wrenches.
- Always pull toward yourself, never push, since it is easier to brace against a sudden lunge toward you should the tool slip or break.
- When using a wrench on a tight nut - first use some penetrating oil, use the largest wrench available that fits the nut, when possible pull on the wrench handle rather than pushing, and when possible apply force to the wrench with both hands while both feet are firmly placed. Always assume that you may lose your footing - check the place where you may fall for sharp objects.
- Keep all pipe wrenches clean and in good repair. The jaws of pipe wrenches should be wire brushed frequently to prevent an accumulation of dirt and grease that would otherwise build up and cause wrenches to slip.
- Never use pipe wrenches in place of a rod holding device.
- Replace hook and heel jaws when they become visibly worn.
- Position your hands so that your fingers will not be smashed between the wrench handle and the ground or other work surface; when breaking joints the wrench may slip or the joint may suddenly let go.

IMPACT TOOLS

Impact tools include various types of hammers such as riveting hammers, carpenter's claw hammers, and sledgehammers. The main hazard associated with all these tools is damage to the hands and arms. The following safety procedures should be employed when using hammers:

- The handle shall be securely fitted and suited for the type of job and type of hammerhead. The striking face of the hammer shall be kept well dressed according to the application.
- The handle shall be smooth and free of oil to prevent slippage.
- Safety goggles shall be worn at all times when hammering to protect from flying nails, wood chips, and metal or plastic fragments.

- To properly drive a nail, hold the hammer near the end of the handle and start off with a light blow. Increase power after the nail is set.
- To avoid chipping or spalling of the hammerhead, use the lightest swing possible, hammer straight and not on an angle. Inspect the head of the hammer for potential chipping and spalling.

Hammers

- Use the correct hammer for the type of work to be done.
- Have an unobstructed swing when using a hammer and watch for overhead interference.
- Check for defects before using.
- The head of a hammer shall be wedged securely and squarely on the handle and neither the head nor the handle shall be chipped or broken.

CUTTING TOOLS

The main hazard associated with cutting tools is tool slippage. A dull tool or poor tool technique can cause a slip, which can redirect the cutting part of the tool toward the body. In addition, a sudden release or change in the force applied to a tool can throw the user off balance, possibly falling into another object, which may cause injury. To prevent slippage, tools shall be kept sharp and handled in such a way that, if a slip occurs, the direction of force will be away from the body. In addition, cutting along the grain of a material can help prevent changes in the pressure applied to the tool, thereby preventing slippage.

Chisels

- Always wear safety goggles or a face shield when using a chisel.
- Drive wood chisel outward and away from your body.
- Do not use chisels to pry.
- Keep edges sharp for most effective work and protect when not in use.

Knives

- Always cut away from the body.
- Keep hands and body clear of the knife stroke.
- Use a locking blade knife when possible.
- Keep blades sharp.
  - Knives and other sharp or edged tools must be maintained in proper condition. A sharp edged tool, used properly, is safer than a dull or improperly maintained tool.
  - When not in immediate use edged tools must be properly secured via, sheathing, closing, capping or covering.
  - Any task involving the use of an edged tool must be properly evaluated, alternatives to edged tools reviewed and training in the proper use, maintenance and handling verified by management and/or the site safety officer.
  - Knives, box cutters or like tools will not be authorized for cutting plastic wire ties or tubing. Use appropriately shaped and sized wire cutters or snips.
  - Remove knives from carry on luggage and place in checked baggage.

POWERED TOOLS

- Portable power tools shall be carefully inspected before use and shall be kept repaired.
- Switches and plugs must operate properly, and the cords must be clean and free from defects.
- Portable powered tools capable of receiving guards and/or designed to accommodate guards shall be equipped with guards to prevent the operator from having any part of his body in the danger zone during the operating cycle.
- Electric powered portable tools with exposed conducting parts shall be grounded. Portable tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Where such an approved system is employed, the equipment shall be distinctively marked.
- Hand-held powered tools of a hazardous nature such as circular saws having a blade diameter greater than two inches, chain saws, percussion tools, drills, tappers, fasteners, drivers, grinders with wheels greater than two inches in diameter, disc sanders, belt sanders, reciprocating saws, saber scroll saws and jig saws with blade shanks greater than one-fourth inch, and other similarly operating powered tools shall be equipped with a constant pressure switch or control ("dead-man switch") that will shut the power off when the pressure is released.
- Portable circular saws having a blade diameter over two inches shall be equipped with guards or hoods which will automatically adjust themselves to the work when the saw is in use, so that none of the teeth are exposed to contact above the work. When withdrawn from the work, the guard shall completely cover the saw to at least the depth of the teeth. The saw shall not be used without a shoe or guide.
- Pneumatic powered portable tools shall be equipped with automatic air shut-off valves that stop the tool when the operators hand is no longer in contact with the tool. Safety clips, retainers, or other effective means shall be installed on pneumatic tools to prevent the tools from accidentally misfiring.
- Abrasive wheels with a diameter of more than two inches shall be used only on machines provided with safety guards. The guards shall cover the spindle end, nut, and flange projections. Guards on operations where the work provides a suitable measure of protection to the operator may be so constructed that the spindle end, nut, and other flanges are exposed.
- Explosive-actuated fastening tools' muzzle ends shall have a protective shield or guard designed to confine any flying fragments or particles. The tool shall be so designed that it cannot be fired unless it is equipped with a protective shield or guard. Weston Solutions, Inc. employees are not permitted to use a power-actuated tool until properly trained as prescribed by the manufacturer.

Extension Cords

See FLD 35, Electric Safety, for requirements and procedures for using extension cords.

SPECIALTY TOOLS

Pneumatic Powered Tools

Tools powered by air must be inspected and maintained as described above. Hose or tubing used to deliver air to pneumatic tools must be used as required and according to procedures in FLD 16, Pressure Systems: Compressed Gas Systems.

Powder-Actuated Tools

- Only employees who have been trained in the operation of the particular tool in use shall be allowed to operate a powder-actuated tool.
- Powder-actuated tools shall be tested each day before loading to see that safety devices are in proper working condition. The method of testing shall be in accordance with the manufacturer's recommended procedure.
- Any tool found not in proper working order, or that develops a defect during use, shall be immediately removed from service and not used until properly repaired.
- Personal protective equipment shall be selected in accordance with manufacturer’s recommendations and in consideration of the potential hazards of the task.
- Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any employees. Hands shall be kept clear of the open barrel end.
- Loaded tools shall not be left unattended.
- Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tile, surface-hardened steel, glass block, live rock, face brick, or hollow tile.
- Driving into materials easily penetrated shall be avoided unless such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side.
- No fastener shall be driven into a spalled area caused by an unsatisfactory fastening.
- Tools shall not be used in an explosive or flammable atmosphere.
- All tools shall be used with the correct shield, guard, or attachment recommended by the manufacturer.
- Powder-actuated tools used by employees shall meet all other applicable requirements of American National Standards Institute, A10.3-1970, Safety Requirements for Explosive-Actuated Fastening Tools.

FLD 43 BIOLOGICAL HAZARDS - GENERAL

RELATED FLDS

FLD 44 – Biological Hazards – Bloodborne Pathogens Exposure Control Plan – First Aid Providers
FLD 45 – Biological Hazards – Bloodborne Pathogens Exposure Control Plan – Work with Infectious Waste

Field personnel and travelers may encounter biological hazards that include endemic hazards as follows: animals, insects, molds and fungus, and plants. In addition, personnel may be exposed to etiological agents (infectious diseases). An important part of health and safety planning and protection includes identifying and understanding local flora and fauna. Animals, insects, molds, fungus, and poisonous plants, and potential for exposure to infectious agents, which are also referred to as microbes, vary from site to site. Their likelihood of causing harm also varies. Risk assessment and protection protocol determinations include knowing the how, where, and what of hazardous types of plants, animals, insects, molds and fungus and infectious agents (microbes).

A set of guidance documents on the WESTON EHS Portal Site describe General Biological Hazards. While extensive, these guidance documents may not be all inclusive. They should provide a starting point for developing Accident Prevention Plans and Site-Specific Health and Safety Plans, but staff is encouraged to review additional information sources. A variety of resources are available to determine potential biological hazards at a work location, including the local health department.

Guidance documents on the EHS Portal Site provide information on the following biological hazards:

- Animals
- Insects
- Molds And Fungi
- Poisonous Plants
- Infectious Diseases (Microbes)

FLD 43A ANIMALS

Animals represent hazards because of their poisons or venoms, size and aggressiveness, diseases transmitted, or the insects they may carry.

Feral Animals

Landfills and abandoned buildings often attract stray or abandoned dogs. These animals often become pack-oriented, very aggressive, and represent serious risk of harm to unprotected workers.

Workers entering abandoned buildings should be alert for such animals and avoid approaching them since this may provoke aggressive behavior. Avoidance and protection protocols include watching for animal dens, using good housekeeping, and using repellents.

Dangerous Wild Animals

Work in remote areas inhabited by wild animals that have been known to cause injury and kill human beings, requires that companies working in these areas carefully plan for wildlife encounters. This FLD outlines actions that, when properly implemented, should provide a high degree of protection for WESTON employees and wildlife. In limited cases, the use of firearms by qualified persons may be permitted in order to safeguard project personnel – See Attachment 5.

Venomous Snakes and Lizards

Venomous Shakes

Venomous snakes are common around the world. The major variables are the likelihood of encounter and the snake that is likely to be encountered. Encounters with snakes may be caused by moving containers, reaching into holes, or just walking through high grass, swampy areas, or rocks. **Do not attempt to catch any snakes.**

Symptom of venomous snake bites:

- Bloody wound discharge, blurred vision, burning, convulsions, diarrhea, dizziness, excessive sweating, fainting, fang marks in the skin, fever, increased thirst, local tissue death, loss of muscle coordination, nausea and vomiting, numbness and tingling, rapid pulse, severe pain, skin discoloration, swelling at the site of the bite, weakness.

Venom from venomous snakes and lizards can be divided into three types of toxins, however, there are some indications that snake venom may have more than one toxin and characteristics may change as a snake ages. The three types of toxins and their effects are:

Hemotoxins destroy blood cells and affect the circulatory system. The site of the bite rapidly becomes swollen, discolored, and painful. This is usually accompanied by swelling, discoloration, and pain progressing toward the heart.

Neurotoxins affect the nervous system and symptoms vary from foggy vision, dizziness, and other comparatively mild symptoms to rigid or flaccid paralysis, shortness of breath, weakness or paralysis of the lower limbs, double vision, inability to speak or swallow, drooping eyelids, and involuntary tremors of the facial muscles. Death can occur in as little as ten minutes, usually due to abrupt cessation of respiration.
Myotoxins destroy cells and cause muscle necrosis.

In the US, with the exception of the coral snakes which tend to have neuron-toxic venom, most venomous snakes have been categorized as having hemotoxic venom (in some areas Mojave rattlesnakes are found to have neuron-toxic venom). There is some indication that some species of rattlesnakes have both hemotoxic and neuron-toxic venom. It is also reported that venom of younger snakes may be more neuron-toxic

There are many are highly venomous snakes worldwide, some are deadly and most can be deadly without proper care.

Lizards

There are two lizards recognized as venomous, the Gila monster and the Mexican Beaded Lizard. Venom of the Gila monster is considered to be neuron-toxic and that of the Mexican Beaded Lizard is considered to be hemo-toxic.

Geographical Listing of Venomous Snakes and Lizards

Following is a list of poisonous snakes and lizards by geographic area. This list is extensive but may not be all inclusive. In planning for work around the world, also contact local agencies to determine whether there may be additional venomous snakes or lizards.

North America (including Mexico)

Copperheads (Broad-banded, Northern, Osage, Southern, Trans-Pecos)
Rattlesnakes (Banded rock, Black-tailed, Canebrake, Diamondback [eastern and western], Massasauga (eastern and western), Mojave, Mottled rock, Pacific (northern and southern), Pigmy (southeastern and western), Prairie, Red diamond, Ridge-nosed, Sidewinder, Speckled, Tiger, Timber, Twin-spotted)
Coral Snake (Arizona, Eastern, Texas, Western (red bands touching yellow "bad fellow")
Cottonmouth or water moccasin (Eastern, Florida, Western)

North America - Lizards

Gila Monster

Central and South America – Venomous Snakes

Bushmaster, Eyelash Pit Viper, Fer-de-lance, Jumping Viper, Tropical Rattlesnake

Central and South America – Venomous Lizards

Mexican Beaded Lizard

Europe

Common Adder, Long-Nosed Adder, Pallas Viper, Ursini Viper

Venomous Snakes of Africa and Asia

Boomslang, Bush Viper, Common Cobra, Egyptian Cobra, Gaboon Viper, Green Mamba, Green Tree Pit Viper, Habu Pit Viper, Horned Desert Viper, King Cobra, Krait, Levant Viper, Malayan Pit Viper, McMahon's Viper, Mole Viper or Burrowing Viper, Palestinian Viper, Puff Adder, Rhinoceros Viper or River Jack, Russel's Viper, Sand Viper, Saw-Scaled Viper, Wagler's Pit Viper or Temple Viper,

Australasia

Australian Copperhead, Death Adder, Taipan, Tiger Snake,

Poisonous Sea Snakes
Banded Sea Snake, Yellow-bellied Sea Snake

Prevention of Bites

Key factors to working safely in areas where snakes or lizards may be encountered include:

- Be alert
- Use care when reaching into or moving containers
- Use sticks or long-handled tools when reaching where you cannot see
- Be familiar with the habits and habitats of snakes in the vicinity of an incident or site
- In areas or activities where encounters with snakes are likely, wear sturdy leather or rubber work boots and snake chaps
- Do not attempt to catch snakes unless required and qualified

A snake bite warrants medical attention after administration of proper first-aid procedures. It is important to contact local medical facilities to determine where anti-venoms are located.

First-Aid

1. Keep the person calm. Restrict movement, and keep the affected area below heart level to reduce the flow of venom.

2. Remove any rings or constricting items because the affected area may swell. Create a loose splint to help restrict movement of the area.

3. If the area of the bite begins to swell and change color, the snake was probably venomous.

4. Monitor the person's vital signs -- temperature, pulse, rate of breathing, and blood pressure if possible. If there are signs of shock (such as paleness), lay the person flat, raise the feet about a foot, and cover the person with a blanket.

5. Get medical help immediately.

6. Try to photograph or identify the snake. Do not waste time hunting for the snake, and do not risk another bite. Be careful of the head of a dead snake. A snake can actually bite for up to an hour after it is dead (from a reflex).

- DO NOT allow the person to become over-exerted. If necessary, carry the person to safety.
- DO NOT apply a tourniquet.
- DO NOT apply cold compresses to a snake bite.
- DO NOT cut into a snake bite with a knife or razor.
- DO NOT try to suction the venom by mouth.
- DO NOT give stimulants or pain medications unless instructed to do so by a doctor.
- DO NOT give the person anything by mouth.
- DO NOT raise the site of the bite above the level of the person's heart
- Transport the victim to medical attention immediately

Animal Borne Diseases

Rabies

Animal borne diseases include rabies (generally found in dogs, skunks, raccoons, bats, and foxes). Rabies varies from area to area as do the animals most likely to be rabid.

Questions and Answers about Rabies

Q. What is Rabies and how is it transmitted?

A. Rabies is a viral infection most often transmitted by bites of animals infected with the virus.

Q. What animals are most likely to be infected?

A. Skunks, raccoons, foxes, and bats are wild animals most frequently found to be infected with rabies; however, any warm blooded animal can be infected. Squirrels, groundhogs, horses, cattle, and rabbits have been tested positive for rabies. Dogs and cats are frequently rabies-infected if not immunized.

Q. How can you tell if an animal is rabies-infected?

A. Rabies infection is not always apparent. Signs to look for in wild animals are over-aggressiveness or passivity. Spotting animals which are normally nocturnal (active at night) during the day and being able to approach them would be an example of unusual behavior. Finding a bat alive and on the ground is abnormal. The best precaution, however, is to observe wild animals from a safe distance, even if they are injured. Avoid dogs and cats that you do not know.

Q. What should you do if bitten by an animal you suspect is infected with rabies?

A. As quickly as possible, wash the bite area with soap and water, then disinfect with 70% alcohol and seek medical attention for follow-up. Try to capture the animal. Avoid being bitten again or contacting the mouth or any saliva of the animal. Keep the animal under surveillance and call the police for assistance to capture it. Have the animal tested.

A dead animal believed to be infected should be preserved and tested for rabies. Health departments are often sources where information can be found regarding testing.

Q. Is there a cure for rabies?

A. Rabies is preventable, even after being bitten, if treatment is begun soon enough. Getting prompt medical attention and confirming the rabies infection of an animal are very important. **Rabies is not curable once symptoms or signs of rabies appear.**

There are vaccines available that should be considered if a work assignment involves trapping animals likely to carry rabies. Medical consultants must be involved in decisions to immunize workers against rabies.

Hantavirus

WESTON employees or contractors/subcontractors conducting field work in areas where there is evidence of a rodent population should be aware of an increased level of concern regarding the transmission of “Hantavirus”-associated diseases. Hantavirus is associated with rodents, especially the deer mouse (*Peromyscus maniculanis*) as a primary reservoir host. Hantavirus has resulted in several deaths in the U.S.

The Hantavirus can be transmitted by infected rodents through their saliva, urine, and feces. Human infection may occur when infected wastes are inhaled as a result of aerosols produced directly from the animals. They also may come from dried materials introduced into broken skin or onto mucous membranes. Infections in humans occur most in adults and are associated with activities that provide contact with infected rodents in rural/semi-rural areas. Hantavirus begins with one or more flu-like symptoms (i.e., fever, muscle aches, headache, and/or cough) and progresses rapidly to severe lung disease. Early diagnosis and treatment are vital.

Prevention

Personnel involved in work areas where rodents and the presence of the Hantavirus are known or suspected will need to take personal protective measures and to develop an expanded site safety plan.

Field personnel involved in trapping or contacting rodents or their waste products will need to wear respirators with high-efficiency particulate air (HEPA) filters, eye protection, Tyvek coveralls, chemical-resistant gloves, and disposable boot covers. Strict decontamination requirements are needed. Double-bag, label, and specific handling, packaging, shipping, storage, and analytical procedures are required to minimize the risks of exposure from collected mice. More detailed procedures can be obtained from WESTON Corporate Environmental Health and Safety.

For employees and facilities in rural/semi-rural areas, the following risk-reduction strategies are appropriate:

- Eliminate rodents and reduce availability of food sources and nesting sites used by rodents.
- Store trash/garbage in rodent-proof metal or thick plastic containers with tight lids.
- Cut all grass/underbrush in proximity to buildings.
- Prevent rodents from entering buildings (e.g., use steel wool, screen, etc., to eliminate openings).

Plague

Described under Insects (Fleas)

Anthrax

Anthrax is an acute infectious disease caused by the spore-forming bacterium *Bacillus anthracis*. Anthrax most commonly occurs in wild and domestic lower vertebrates (cattle, sheep, goats, camels, antelopes, and other herbivores), but it can also occur in humans when they are exposed to infected animals or tissue from infected animals.

Anthrax is most common in agricultural regions where it occurs in animals. These include South and Central America, Southern and Eastern Europe, Asia, Africa, the Caribbean, and the Middle East. When anthrax affects humans, it is usually due to an occupational exposure to infected animals or their products. Workers who are exposed to dead animals and animal products from other countries where anthrax is more common may become infected with *B. anthracis* (industrial anthrax). Anthrax in wild livestock has occurred in the U.S.

Anthrax infection can occur in three forms: cutaneous (skin), inhalation, and gastrointestinal. *B. anthracis* spores can live in the soil for many years, and humans can become infected with anthrax by handling products from infected animals or by inhaling anthrax spores from contaminated animal products. Anthrax can also be spread by eating undercooked meat from infected animals. It is rare to find infected animals in the U.S.

Cutaneous: Most (about 95%) anthrax infections occur when the bacterium enters a cut or abrasion on the skin, such as when handling contaminated wool, hides, leather, or hair products (especially goat hair) of infected animals. Skin infection begins as a raised itchy bump that resembles an insect bite but within 1-2 days develops into a vesicle and then a painless ulcer, usually 1-3 cm in diameter, with a characteristic black necrotic (dying) area in the center. Lymph glands in the adjacent area may swell. About 20% of untreated cases of cutaneous anthrax will result in death. Deaths are rare with appropriate antimicrobial therapy.

Inhalation: Initial symptoms may resemble a common cold. After several days, the symptoms may progress to severe breathing problems and shock. Inhalation anthrax is usually fatal.

Intestinal: The intestinal disease form of anthrax may follow the consumption of contaminated meat and is characterized by an acute inflammation of the intestinal tract. Initial signs of nausea, loss of appetite, vomiting, and fever are followed by abdominal pain, vomiting of blood, and severe diarrhea. Intestinal anthrax results in death in 25% to 60% of cases.

Anthrax is not known to spread from one person to another person. Communicability is not a concern in managing or visiting patients with inhalation anthrax.

Prevention

In countries where anthrax is common and vaccination levels of animal herds are low, humans should avoid contact with livestock and animal products and avoid eating meat that has not been properly slaughtered and cooked. Also, an anthrax vaccine has been licensed for use in humans. The vaccine is reported to be 93% effective in protecting against anthrax.

Doctors can prescribe effective antibiotics. To be effective, treatment should be initiated early. If left untreated, the disease can be fatal.

Direct person-to-person spread of anthrax is extremely unlikely; however, a patient's clothing and body may be contaminated with anthrax spores. Effective decontamination of people can be accomplished by a thorough wash down with anti-microbe effective soap and water. Waste water should be treated with bleach or other anti-microbial agent. Effective decontamination of articles can be accomplished by boiling contaminated articles in water for 30 minutes or longer and using common disinfectants. Chlorine is effective in destroying spores and vegetative cells on surfaces. Burning the clothing is also effective. After decontamination, there is no need to immunize, treat, or isolate contacts of people ill with anthrax unless they also were also exposed to the same source of infection. Early antibiotic treatment of anthrax is essential–delay seriously lessens chances for survival. Treatment for anthrax infection and other bacterial infections includes large doses of intravenous and oral antibiotics, such as fluoroquinolones, like ciprofloxacin (cipro), doxycycline, erythromycin, vancomycin, or penicillin. In possible cases of inhalation anthrax exposure to unvaccinated personnel, early antibiotic prophylaxis treatment is crucial to prevent possible death.

No skin, especially if it has any wounds or scratches, should be exposed. Disposable personal protective equipment is preferable, but if not available, decontamination can be achieved by washing any exposed equipment in hot water, bleach and detergent. Disposable personal protective equipment and filters should be burned and buried. The size of Bacillus anthracis bacillii ranges from 0.5 μm to 5.0 μm. Anyone working with anthrax in a suspected or confirmed victim should wear respiratory equipment capable of filtering this size of particle or smaller. The U.S. National Institute for Occupational Safety and Health (NIOSH) and Mine Safety and Health Administration (MSHA) approved high efficiency-respirator, such as a half-face disposable respirator with a HEPA filter, is recommended. All possibly contaminated bedding or clothing should be isolated in double plastic bags and treated as possible bio-hazard waste. Dead victims that are opened and not burned provide an ideal source of anthrax spores; the victim should be sealed in an airtight body bag. Cremating victims is the preferred way of handling body disposal. No embalming or autopsy should be attempted without a fully equipped biohazard lab and trained and knowledgeable personnel.

Delays of only a few days may make the disease untreatable and treatment should be started even without symptoms if possible contamination or exposure is suspected. Animals with anthrax often just die without any apparent symptoms. Initial symptoms may resemble a common cold – sore throat, mild fever, muscle aches and malaise. After a few days, the symptoms may progress to severe breathing problems and shock and ultimately death. Death can occur from about two days to a month after exposure with deaths apparently peaking at about 8 days after exposure. Antibiotic-resistant strains of anthrax are known.

Aerial spores can be trapped by a simple HEPA or P100 filter. Inhalation of anthrax spores can be prevented with a full-face mask using appropriate filtration. Unbroken skin can be decontaminated by washing with simple soap and water. All of these procedures do not kill the spores which are very hard to kill and require extensive treatment to eradicate them. Filters, clothes, etc. exposed to possible anthrax contaminated environments should be treated with chemicals or destroyed by fire to minimize the possibility of spreading the contamination.

In recent years there have been many attempts to develop new drugs against anthrax; but the existing supply still works fine if treatment is started soon enough.

Prevention can also be accomplished through early detection. In response to the U.S. Postal Service (USPS) anthrax attacks of October 2001, the USPS has installed BioDetection Systems (BDS) in their large-scale mail cancellation facilities. BDS response plans have been formulated by the USPS in conjunction with local responders including fire, police, hospitals, and public health. Employees of these facilities have been educated about anthrax, response actions and prophylactic medication. Because of the time delay inherent in getting final verification that anthrax has been used, prophylactic antibiotics for possibly exposed personnel should commence as soon as possible.

The ultimate in prevention is vaccination against infection but this has to be done well in advance of exposure.

Anthrax spores can survive for long periods of time in the environment after release. Methods for cleaning anthrax contaminated sites commonly use oxidizing agents such as peroxides, ethylene Oxide, Sandia Foam, chlorine dioxide (used in the Hart Senate office building), and liquid bleach products containing sodium hypochlorite. These agents slowly destroy bacterial spores. A bleach solution for treating hard surfaces has been approved by the EPA and can be prepared by mixing one part bleach (5.25%-6.00%) to one part white vinegar to eight parts water. Bleach and vinegar must not be combined together directly, rather some water must first be added to the bleach (e.g., two cups water to one cup of bleach), then vinegar (e.g., one cup), and then the rest of the water (e.g., six cups). The pH of the solution should be tested with a paper test strip; and treated surfaces must remain in contact with the bleach solution for 60 minutes (repeated applications will be necessary to keep the surfaces wet).

Chlorine dioxide has emerged as the preferred biocide against anthrax-contaminated sites, having been employed in the treatment of numerous government buildings over the past decade. Its chief drawback is the need for *in situ* processes to have the reactant on demand.

To speed the process, trace amounts of a non-toxic catalyst composed of iron and tetro-amido macrocyclic ligands are combined with sodium carbonate and bicarbonate and converted into a spray. The spray formula is applied to an infested area and is followed by another spray containing tertiary-butyl hydroperoxide

Using the catalyst method, a complete destruction of all anthrax spores takes 30 minutes. A standard catalyst-free spray destroys fewer than half the spores in the same amount of time. They can be heated, exposed to the harshest chemicals, and they do not easily die.

Brucellosis

Brucellosis, also called undulant fever or Malta fever, is a zoonosis (infectious disease transmitted from animals to humans) caused by bacteria of the genus *Brucella*. It is primarily a disease of domestic animals (goats, pigs, cattle, dogs, etc.) and humans and has a worldwide distribution.

Although brucellosis can be found worldwide, it is more common in countries that do not have good standardized and effective public health and domestic animal health programs. Areas currently listed as high risk are the Mediterranean Basin (Portugal, Spain, Southern France, Italy, Greece, Turkey, and North Africa), South and Central America, Eastern Europe, Asia, Africa, the Caribbean, and the Middle East.

The disease is transmitted either through contaminated or untreated milk (and its derivates) or through direct contact with infected animals, which may include dogs, pigs, camels, and ruminants, primarily sheep, goats, cattle, and bison. This also includes contact with their carcasses.

Leftovers from parturition are also extremely rich in highly virulent brucellae. Brucellae, along with leptospira have the unique property of being able to penetrate through intact human skin, so infection by mere hand contact with infectious material is likely to occur.

The disease is now usually associated with the consumption of un-pasteurized milk and soft cheeses made from the milk of infected animals and with occupational exposure of veterinarians and slaughterhouse workers. Some vaccines used in livestock, most notably *B. abortus* strain 19 also cause disease in humans if accidentally injected. Problems with vaccine induced cases in the United States declined after the release of the RB-51 strain developed in the 1990s and the relaxation of laws requiring vaccination of cattle in many states.

The incubation period of brucellosis is, usually, of one to three weeks, but some rare instances may take several months to surface.

Brucellosis induces inconstant fevers, sweating, weakness, anemia, headaches, depression and muscular and bodily pain.

The symptoms are like those associated with many other febrile diseases, but with emphasis on muscular pain and sweating. The duration of the disease can vary from a few weeks to many months or even years. In first stage of the disease, septicemia occurs and leads to the classic triad of undulant fevers, sweating (often with characteristic smell, likened to wet hay) and migratory arthralgia and myalgia.

Prevention

The main way of preventing brucellosis is by using fastidious hygiene in producing raw milk products, or by pasteurization of all milk that is to be ingested by human beings, either in its pure form or as a derivate, such as cheese.

Provide protection from skin contact when handling potentially infected animals.

Q fever

Q fever is caused by infection with *Coxiella burnetii*. This organism is uncommon but may be found in cattle, sheep, goats and other domestic mammals, including cats and dogs. The infection results from inhalation of contaminated particles in the air, and from contact with the vaginal mucus, milk, feces, urine or semen of infected animals. The incubation period is 9-40 days.
It is considered possibly the most infectious disease in the world, as a human being can be infected by a single bacterium.

The most common manifestation is flu-like symptoms with abrupt onset of fever, malaise, profuse perspiration, severe headache, myalgia (muscle pain), joint pain, loss of appetite, upper respiratory problems, dry cough, pleuritic pain, chills, confusion and gastro-intestinal symptoms such as nausea, vomiting and diarrhea. The fever lasts approximately 7-14 days.

During the course, the disease can progress to an atypical pneumonia, which can result in a life threatening acute respiratory distress syndrome (ARDS), whereby such symptoms usually occur during the first 4-5 days of infection.

Less often the Q fever causes (granulomatous) hepatitis which becomes symptomatic with malaise, fever, liver enlargement (hepatomegaly), and pain in the right upper quadrant of the abdomen and jaundice (icterus).

The chronic form of the Q fever is virtually identical with the inflammation of the inner lining of the heart (endocarditis), which can occur after months or decades following the infection. It is usually deadly if untreated. However, with appropriate treatment this lethality is around 10%.

The pathogenic agent is to be found everywhere except Antarctica and New Zealand. In Europe it appears as hepatitis rather than pneumonia as in the United States. The common way of infection is inhalation of contaminated dust, contact with contaminated milk, meat, wool and particularly birthing products. Ticks can transfer the pathogenic agent to other animals. Transfer between humans seems extremely rare and has so far been described in very few cases.

Prevention

Q fever is effectively prevented by intradermal vaccination with a vaccine composed of killed *Coxiella burnetii* organisms. Skin and blood tests should be done before vaccination to identify preexisting immunity; the reason is that vaccinating subjects who already have immunity can result in a severe local reaction. After a single dose of vaccine, protective immunity lasts for many years. Revaccination is not generally required. Annual screening is typically recommended.

Wear appropriate PPE when handling potentially infected animals or materials.

Leptospirosis

Leptospirosis is a bacterial disease that affects humans and animals. It is caused by bacteria of the genus *Leptospira*.

The time between a person's exposure to a contaminated source and becoming sick is 2 days to 4 weeks. Illness usually begins abruptly with fever and other symptoms. Leptospirosis may occur in two phases; after the first phase, with fever, chills, headache, muscle aches, vomiting, or diarrhea, the patient may recover for a time but become ill again. If a second phase occurs, it is more severe; the person may have kidney or liver failure or meningitis. This phase is also called Weil's disease.

The illness lasts from a few days to 3 weeks or longer. Without treatment, recovery may take several months. In rare cases death occurs.

Many of these symptoms can be mistaken for other diseases. Leptospirosis is confirmed by laboratory testing of a blood or urine sample.

Leptospira organisms have been found in cattle, pigs, horses, dogs, rodents, and wild animals. Humans become infected through contact with water, food, or soil containing waste from these infected animals. This may happen by consuming contaminated food or water or through skin contact, especially with mucosal surfaces, such as the eyes or nose, or with broken skin. The disease is not known to be spread from person to person.

Leptospirosis occurs worldwide but is most common in temperate or tropical climates. It is an occupational hazard for many people who work outdoors or with animals, for example, farmers, sewer workers, veterinarians, fish workers, dairy farmers, or military personnel. It is a recreational hazard for campers or those who participate in outdoor sports in contaminated areas and has been associated with swimming, wading, and whitewater rafting in contaminated lakes and rivers. The incidence is also increasing among urban children.

The risk of acquiring leptospirosis can be greatly reduced by not swimming or wading in water that might be contaminated with animal urine.

Protective clothing or footwear should be worn by those exposed to contaminated water or soil because of their job or recreational activities.

Prevention

Avoid risky foods and drinks.

Buy it bottled or bring it to a rolling boil for 1 minute before drink it. Bottled carbonated water is safer than non-carbonated water.

Ask for drinks without ice unless the ice is made from bottled or boiled water. Avoid popsicles and flavored ices that may have been made with contaminated water.
Eat foods that have been thoroughly cooked and that are still hot and steaming

Avoid raw vegetables and fruits that cannot be peeled. Vegetables like lettuce are easily contaminated and are very hard to wash well. When eating raw fruit or vegetables that can be peeled, peel them yourself. (Wash your hands with soap first.) Do not eat the peelings.

Avoid foods and beverages from street vendors. It is difficult for food to be kept clean on the street, and many travelers get sick from food bought from street vendors.

Leptospirosis is treated with antibiotics, such as doxycycline or penicillin, which should be given early in the course of the disease. Intravenous antibiotics may be required for persons with more severe symptoms. Persons with symptoms suggestive of leptospirosis should contact a health care provider.

Machupo virus

Machupo virus, Bolivian hemorrhagic fever (**BHF**), also known as **black typhus** is a hemorrhagic fever and zoonotic infectious disease occurring in Bolivia. First identified in 1959, black typhus is caused by infection with machupo virus, a negative single-stranded RNA virus of the arenaviridae family. The infection has a slow onset with fever, malaise, headache and muscular pains. Petechiae (blood spots) on the upper body and bleeding from the nose and gums are observed when the disease progresses to the hemorrhagic phase, usually within seven days of onset. The mortality rate is estimated at 5 to 30 percent.

The vector is the vesper mouse (*Calomys callosus*), a rodent indigenous to northern Bolivia. Infected animals are asymptomatic and shed virus in excretions, by which humans are infected. Evidence of person-to-person transmission of Machupo virus exists but is believed to be rare (Kilgore, et. al, 1995).

Measures to reduce contact between the vesper mouse and humans have effectively limited the number of outbreaks, with no cases identified between 1973 and 1994. A vaccine being developed for the genetically related Junín virus which causes Argentine hemorrhagic fever has shown evidence of cross-reactivity with Machupo virus and may be an effective prophylactic measure for people at high risk of infection.

Prevention

Appropriate PPE including respiratory protection for handling animals or when there is potential exposure to wastes from the animals.

Ebola

Ebola is both the common term used to describe a group of viruses belonging to genus Ebolavirus, family Filoviridae, and the common name for the disease which they cause, Ebola hemorrhagic fever. Ebola viruses are morphologically similar to the Marburg virus, also in the family Filoviridae, and share similar disease symptoms. Ebola has caused a number of serious and highly publicized outbreaks since its discovery.

It is known to be a zoonotic virus as it is currently devastating the populations of lowland gorillas in Central Africa. Despite considerable effort by the World Health Organization, no animal reservoir capable of sustaining the virus between outbreaks has been identified. However, it has been hypothesized that the most likely candidate is the fruit bat.

Ebola hemorrhagic fever is potentially lethal and encompasses a range of symptoms including fever, vomiting, diarrhea, generalized pain or malaise, and sometimes internal and external bleeding. Mortality rates are extremely high, with the human case-fatality rate ranging from 50% - 89%, according to viral subtype. The cause of death is usually due to hypovolemic shock or organ failure.

Because Ebola is potentially lethal and since no approved vaccine or treatment is available, Ebola is classified as a biosafety level 4 agent, as well as a Category A bioterrorism agent by the Centers for Disease Control and Prevention.

Symptoms are varied and often appear suddenly. Initial symptoms include high fever (at least 38.8°C), severe headache, muscle joint, or abdominal pain, severe weakness and exhaustion, sore throat, nausea, and dizziness· Before an outbreak is suspected, these early symptoms are easily mistaken for malaria, typhoid fever, dysentery, influenza, or various bacterial infections, which are all far more common and less reliably fatal.

Ebola may progress to cause more serious symptoms, such as diarrhea, dark or bloody feces, vomiting blood, red eyes due to distention and hemorrhage of sclerotic arterioles, petechia, maculopapular rash, and purpura. Other secondary symptoms include hypotension (less than 90 mm Hg systolic /60 mm Hg diastolic), hypovolemia, tachycardia, organ damage (especially the kidneys, spleen, and liver) as a result of disseminated systemic necrosis, and protinuria. The interior bleeding is caused by a chemical reaction between the virus and the platelets which creates a chemical that will cut cell sized holes into the capillary walls.

Among humans, the virus is transmitted by direct contact with infected body fluids, or to a lesser extent, skin or mucus membrane contact. The incubation period can be anywhere from 2 to 21 days, but is generally between 5 and 10 days.

Although airborne transmission between monkeys has been demonstrated by an accidental outbreak in a laboratory located in Virginia, USA, there is very limited evidence for human-to-human airborne transmission in any reported epidemics.

The infection of human cases with Ebola virus has been documented through the handling of infected chimpanzees, gorillas, and forest antelopes--both dead and alive--as was documented in Côte d'Ivoire, the Republic of Congo and Gabon. The transmission of the Ebola Reston strain through the handling of cynomolgus monkeys has also been reported.

So far, all epidemics of Ebola have occurred in sub-optimal hospital conditions, where practices of basic hygiene and sanitation are often either luxuries or unknown to caretakers and where disposable needles and autoclaves are unavailable or too expensive. In modern hospitals with disposable needles and knowledge of basic hygiene and barrier nursing techniques, Ebola rarely spreads on such a large scale.

Prevention

Prevention methods include good hygiene in medical settings and awareness of the virus in travel areas. There is no known effective vaccine for humans.

Prevention efforts should concentrate on avoiding contact with host or vector species. Travelers should not visit locations where an outbreak is occurring. Contact with rodents should be avoided. Minimize exposure to arthropod bites by using permethrin-impregnated bed nets and insect repellents.

Strict compliance with infection control precautions (i.e., use of disposable gloves, face shields, and disposable gowns to prevent direct contact with body fluids and splashes to mucous membranes when caring for patients or handling clinical specimens; appropriate use and disposal of sharp instruments; hand washing and use of disinfectants) is recommended to avoid health care-associated infections.

Contact with dead primates should be avoided.

Marburg Virus

The **Marburg virus** is the causative agent of **Marburg hemorrhagic fever**. Both the disease and virus are related to Ebola and originate in Uganda and Eastern Congo. The zoonosis is of unknown origin, but fruit bats are suspected. In the spring of 2005, there was an outbreak in Angola.

Because many of the signs and symptoms of Marburg hemorrhagic fever are similar to those of other infectious diseases, such as malaria or typhoid, diagnosis of the disease can be difficult, especially if only a single case is involved.

The disease is spread through bodily fluids, including blood, excrement, saliva, and vomit.

Early symptoms are often non-specific, and usually include fever, headache and myalgia after an incubation period of 3-9 days. After five days, a macropapular rash is often present on the trunk. Later-stage Marburg infection is acute and can include jaundice, pancreatitis, weight loss, delirium and neuropsychiatric symptoms, hemorrhaging, hypovolemic shock and multi-organ dysfunction with liver failure most common.
Accounts of external hemorrhaging from bodily orifices are in fact rare. Time course varies but symptoms usually last for one to three weeks until the disease either resolves or kills the infected host. The fatality rate is between 23-90%.

Prevention

Prevention methods include good hygiene in medical settings and awareness of the virus in travel areas. There is no known effective vaccine for humans.

Prevention efforts should concentrate on avoiding contact with host or vector species. Travelers should not visit locations where an outbreak is occurring. Contact with rodents should be avoided. Minimize exposure to arthropod bites by using permethrin-impregnated bed nets and insect repellents.

Strict compliance with infection control precautions (i.e., use of disposable gloves, face shields, and disposable gowns to prevent direct contact with body fluids and splashes to mucous membranes when caring for patients or handling clinical specimens; appropriate use and disposal of sharp instruments; hand washing and use of disinfectants) is recommended to avoid health care-associated infections.

Contact with dead primates should be avoided.

Rift Valley Fever.

Rift Valley Fever (RVF) is a viral Zoonosis affects primarily domestic livestock, but can be passed to humans) causing fever. It is spread by the bite of infected mosquitoes. The disease is caused by the RVF virus, a member of the genus *Phlebovirus* (family *Bunyaviridae*).

The disease was first reported in Kenya around 1915and has since been reported across sub-Saharan Africa. There have been outbreaks in Egypt in 1977-78, Saudi Arabia and Yemen..

In humans the virus can cause several different syndromes. Usually sufferers have either no symptoms or only a mild illness with fever, headache, myalgia and liver abnormalities. In a small percentage of cases (< 2%) the illness can progress to hemorrhagic fever syndrome, meningoencephalitis inflammation of the brain), or affecting the eye. Patients who become ill usually experience fever, generalized weakness, back pain, dizziness, and weight loss at the onset of the illness. Typically, patients recover within 2-7 days after onset.

The vast majority of human infections result from direct or indirect contact with the blood or organs of infected animals. The virus can be transmitted to humans through the handling of animal tissue during slaughtering or butchering, assisting with animal births, conducting veterinary procedures, or from the disposal of carcasses or fetuses. Certain occupational groups such as herders, farmers, slaughterhouse workers and veterinarians are therefore at higher risk of infection. The virus infects humans through inoculation, for example via a wound from an infected knife or through contact with broken skin, or through inhalation of aerosols produced during the slaughter of infected animals. The aerosol mode of transmission has also led to infection in laboratory workers.

There is some evidence that humans may also become infected with RVF by ingesting the unpasteurized or uncooked milk of infected animals.

Human infections have also resulted from the bites of infected mosquitoes, most commonly the Aedes mosquito.

Transmission of RVF virus by hematophagous (blood-feeding) flies is also possible.

To date, no human-to-human transmission of RVF has been documented, and no transmission of RVF to health care workers has been reported when standard infection control precautions have been put in place.

There has been no evidence of outbreaks of RVF in urban areas.

Mild form of RVF in humans

The incubation period (interval from infection to onset of symptoms) for RVF varies from two to six days.

Those infected either experience no detectable symptoms or develop a mild form of the disease characterized by a feverish syndrome with sudden onset of flu-like fever, muscle pain, joint pain and headache.

Some patients develop neck stiffness, sensitivity to light, loss of appetite and vomiting; in these patients the disease, in its early stages, may be mistaken for meningitis.

The symptoms of RVF usually last from four to seven days, after which time the immune response becomes detectable with the appearance of antibodies and the virus gradually disappears from the blood.

Severe form of RVF in humans

While most human cases are relatively mild, a small percentage of patients develop a much more severe form of the disease. This usually appears as one or more of three distinct syndromes: ocular (eye) disease (0.5-2% of patients), meningoencephalitis (less than 1%) or haemorrhagic fever (less than 1%).

Ocular form: In this form of the disease, the usual symptoms associated with the mild form of the disease are accompanied by retinal lesions. The onset of the lesions in the eyes is usually one to three weeks after appearance of the first symptoms. Patients usually report blurred or decreased vision. The disease may resolve itself with no lasting effects within 10 to 12 weeks. However, when the lesions occur in the macula, 50% of patients will experience a permanent loss of vision. Death in patients with only the ocular form of the disease is uncommon.

Meningoencephalitis form: The onset of the meningoencephalitis form of the disease usually occurs one to four weeks after the first symptoms of RVF appear. Clinical features include intense headache, loss of memory, hallucinations, confusion, disorientation, vertigo, convulsions, lethargy and coma. Neurological complications can appear later (> 60 days). The death rate in patients who experience only this form of the disease is low, although residual neurological deficit, which may be severe, is common.

Haemorrhagic fever form: The symptoms of this form of the disease appear two to four days after the onset of illness, and begin with evidence of severe liver impairment, such as jaundice. Subsequently signs of haemorrhage then appear such as vomiting blood, passing blood in the feces, a purpuric rash or ecchymoses (caused by bleeding in the skin), bleeding from the nose or gums, menorrhagia and bleeding from venipuncture sites. The case-fatality ratio for patients developing the haemorrhagic form of the disease is high at approximately 50%. Death usually occurs three to six days after the onset of symptoms. The virus may be detectable in the blood for up to 10 days, in patients with the hemorrhagic icterus form of RVF.

The total case fatality rate has varied widely between different epidemics but, overall, has been less than 1% in those documented. Most fatalities occur in patients who develop the haemorrhagic icterus form.

A person's chances of becoming infected can be reduced by taking measures to decrease contact with mosquitoes and other bloodsucking insects through the use of mosquito repellents and bednets. Avoiding exposure to blood or tissues of animals that may potentially be infected is an important protective measure for persons working with animals in RVF-endemic areas.

Prevention

Awareness and use of PPE, good hygiene and other avoidance practices used for other zoonotic diseases should be used.

Nipah and Hendra Viruses

Nipah virus is a newly recognized zoonotic virus. The virus was 'discovered' in 1999. It has caused disease in animals and in humans, through contact with infectious animals. The virus is named after the location where it was first detected in Malaysia.

Nipah is closely related to another newly recognized zoonotic virus (1994), called **Hendra** virus, named after the town where it first appeared in Australia. Both Nipah and Hendra are members of the virus family *Paramyxoviridae.* Although members of this group of viruses have only caused a few focal outbreaks, the biologic property of these viruses to infect a wide range of hosts and to produce a disease causing significant mortality in humans has made this emerging viral infection a public heath concern.

Natural Host

It is currently believed that certain species of fruit bats are the natural hosts of both Nipah and Hendra viruses. They are distributed across an area encompassing northern, eastern and south-eastern areas of Australia, Indonesia, Malaysia, the Philippines and some of the Pacific Islands. The bats appear to be susceptible to infection with these viruses, but do not themselves become ill. It is not known how the virus is transmitted from bats to animals.

Transmission

The mode of transmission from animal to animal, and from animal to human is uncertain, but appears to require close contact with contaminated tissue or body fluids from infected animals. Nipah antibodies have been detected in pigs, other domestic and wild animals. The role of species other than pigs in transmitting infection to other animals has not yet been determined.

It is unlikely that Nipah virus is easily transmitted to man, although previous outbreak reports suggest that Nipah virus is transmitted from animals to humans more readily than Hendra virus. Despite frequent contact between fruit bats and humans there is no serological evidence of human infection among bat caregivers. Pigs were the apparent source of infection among most human cases in the Malaysian outbreak of Nipah, but other sources, such as infected dogs and cats, cannot be excluded. Human-to-human transmission of Nipah virus has not been reported.

Clinical Features

Nipah Virus - The incubation period is between 4 and 18 days. In many cases the infection is mild or unapparent (sub-clinical). In symptomatic cases, the onset is usually with "influenza-like" symptoms, with high fever and muscle pains (myalgia). The disease may progress to inflammation of the brain (encephalitis) with drowsiness, disorientation, convulsions and coma. Fifty percent of clinically apparent cases die.

Hendra Virus - respiratory illness with severe flu-like signs and symptoms

Protection

The risk of transmission of Nipah and virus from sick animals to humans is thought to be low, and transmission from person-to-person has not yet been documented, even in the context of a large outbreak. Therefore, the risk of transmission of Nipah virus to health care workers is thought to be low. However, transmission without percutaneous exposure (through a break in the skin barrier) is theoretically possible, as respiratory secretions contain the virus. This is why it has been categorized as a biohazardous agent that should be managed in a high-level biosecurity laboratory. It is recommended that close contact with body fluids and infected tissues be avoided if Nipah or hendra virus infection is suspected.

Bird and Bat Borne or Enhanced Diseases

See also under Molds and Fungus

Psittacosis

Psittacosis is a disease caused by a bacteria that is found in bird droppings and other secretions (often carried by pet birds). The bacteria are found worldwide.

Symptoms of psittacosis infection may include a low-grade fever that often becomes worse as the disease progresses, including anorexia, sore throat, light sensitivity, and a severe headache.

Ammonia and sodium hypochlorite based disinfectants are effective disinfectants for Psittacossis.

Where it is necessary to remove bat droppings from buildings prior to renovation or demolition it is prudent to assume infection and use the following precautions:

- Avoid areas that may harbor the bacteria, e.g., accumulations of bird or bat droppings.

- Areas known or suspected of being contaminated by *the organisms causing* Psittacosis such as bird roosts, attics, or even entire buildings that contain accumulations of bat or bird manure, should be posted with signs warning of the health risk. The building or area should be secured

- Before an activity is started that may disturb any material that might be contaminated by Psittacosis, workers should be informed in writing of the personal risk factors that increase an individual's chances of developing these diseases. Such a written communication should include a warning that individuals with weakened immune systems are at the greatest risk of developing severe forms of these diseases become infected. These people should seek advice from their health care provider about whether they should avoid exposure to materials that might be contaminated with these organisms.

The best way to prevent exposure is to avoid situations where material that might be contaminated can become aerosolized and subsequently inhaled. A brief inhalation exposure to highly contaminated dust may be all that is needed to cause infection and subsequent development of psittacosis. Therefore, work practices and dust control measures that eliminate or reduce dust generation during the removal of bat manure from a building will also reduce risks of infection and subsequent development of disease. For example, instead of shoveling or sweeping dry, dusty material, carefully wetting it with a water spray can reduce the amount of dust aerosolized during an activity. Adding a surfactant or wetting agent to the water might reduce further the amount of aerosolized dust.

Once the material is wetted, it can be collected in double, heavy-duty plastic bags, a 55-gallon drum, or some other secure container for immediate disposal. An alternative method is use of an industrial vacuum cleaner with a high-efficiency filter to *bag* contaminated material. Truck-mounted or trailer-mounted vacuum systems are recommended for buildings with large accumulations of bat or bird manure. These high-volume systems can remove tons of contaminated material in a short period. Using long, large-diameter hoses, such a system can also remove contaminated material located several stories above its waste hopper. This advantage eliminates the risk of dust exposure that can happen when bags tear accidentally or containers break during their transfer to the ground.

The removal of all material that might be contaminated from a building and immediate waste disposal will eliminate any further risk that someone might be exposed to aerosolized spores. Air sampling, surface sampling, or the use of any other method intended to confirm that no infectious agents remain following removal of bat manure is unnecessary in most cases. However, before a removal activity is considered finished, the cleaned area should be inspected visually to ensure that no residual dust or debris remains.

Spraying 1:10 bleach to water mixture on droppings and allowing it to dry is also a recommended practice for the psittacosis organisms.

Because work practices and dust control measures to reduce worker exposures to these organisms have not been fully evaluated, using personal protective equipment is still necessary during some activities. During removal of an accumulation of bat or bird manure from an enclosed area such as an attic, dust control measures should be used, but wearing a NIOSH-approved respirator and other items of personal protective equipment is also recommended to reduce further the risk of exposure to the organisms that cause Psittacosis.

Treatment

Psittacosis is often hard to diagnoses and while a concern, it does not occur with great frequency. Knowledge of the symptoms and of potential exposure is important when seeking medical follow-up for potential exposure.

There are various medical treatments for psittacosis based on extent of infection. The sooner the disease is diagnosed and treatment is begun the more effective the treatment will be.

APPENDIX A
Dangerous Animals - Wildlife Hazard Recognition and Protection

GENERAL

Work in remote areas inhabited by wild animals that have been known to cause injury and kill human beings, requires that companies working in these areas carefully plan for wildlife encounters. This procedure outlines actions that when properly implemented should provide a high degree of protection for employees and wildlife.

These procedures apply to employees who prepare Health and Safety Plans or perform fieldwork in environments in which wild animals may be encountered. However, due to the unpredictable nature of wild animals this single document cannot possibly cover all potential risks or protective measures. Therefore, prior to entering remote areas inhabited by dangerous wildlife, contact local wildlife agencies to gather additional information concerning local risks and protective measures.

REFERENCES

Alaska Administrative Code 5 AAC 92.230 and 5 AAC 92.410.
Alaska Department of Fish and Game, Division of Wildlife Conservation.
http://www.state.ak.us/adfg/adfghome.htm
State of Washington Fish and Wildlife, Living with Wildlife.
http://www.wa.gov/wdfw/wildlife.htm

ATTACHMENTS

Attachments 1 through 4 outline behavioral characteristics of and outline controls that will minimize human injury, loss of property, and unnecessary destruction of wildlife, while ensuring a safe work environment. Attachment 5 provides the Project Specific Exemption for Firearms request form.

RESPONSIBILITIES

The responsibilities of personnel involved in Wildlife Hazard Recognition and Protection are:

- The Corporate EHS Director review and approval of site health and safety plans (HASP) that require the Project-Specific Approval for Use of Firearms.
- Project Manager / Site Manager: In addition to the safety responsibilities described in the Safety Program Implementation Plan, the Project Manager (PM) or Site Manager (SM) are responsible for ensuring that the Health and Safety Plan (HASP) addresses hazards associated with wild animal encounters, as appropriate and ensuring that persons designated to carry firearms meet the criteria outlined in this procedure. Additionally, if other approvals are necessary for carrying firearms, the PM must ensure that adequate time is allotted for the approval process.
- There are three prerequisites for a person to be authorized to possess a firearm on a WESTON work site: (a) legal eligibility, (b) adequate training, and (c) mature judgment. The first two prerequisites are objective in nature and are described in the following pages. The third prerequisite is subjective in nature and is determined by a consensus of the appropriate safety, site and project managers, based on their personal assessment of the individual to be armed.

WILDLIFE AVOIDANCE AND BASIC PROTECTIVE MEASURES

The best protective measure is simply avoidance. Large numbers of humans present deterrence to wild animals; therefore, whenever possible teams in the field should work together in groups of four or more. Whenever practical, fieldwork should be scheduled around the seasonal cycles of wildlife in the area. When wild animal avoidance cannot be achieved through scheduling, personnel involved in field activities in which encounters with wild animals may result, will take the following steps and will be equipped and trained, as set forth below.

CLEAR THE AREA

Evaluate and control the area before entry by

- Determine areas of recent sightings through local Fish and Game, state troopers, etc.;
- Conduct a site observation from an off-site elevated point, if possible;
- Conduct a controlled walk through in the area by a trained observer;
- Arrange a briefing by a local specialist, e. g., Fish and Game, etc.; and
- Utilizing appropriate noisemakers.

BASIC EQUIPMENT

Employees entering an environment where encounters with wild animals are possible should be provided, as a minimum:

- Noisemakers, such as air horns, bells, etc.; and
- Bear spray of not less than 16-ounce capacity (with holster), equivalent to capsicum pepper (red pepper extract), which is capable of spraying at least 15 feet. (Notes: Normally cannot be transported in side aircraft passenger compartments and may be considered a hazardous material, check with airlines and hazardous material shippers for current information).

TRAINING

Prior to entering and / or working in areas inhabited by dangerous wildlife each employee should receive training as outlined in this procedure. At a minimum, training must include information related to:

- Wildlife present, habitat, behavior patterns, including when wild animals are most active, etc.
- Warning signs, such as tracks, bedding areas, scat, claw marks, offspring, paths, etc.,
- Avoidance measures
- Other hazards, precautions, and protective measures as outlined in the Attachments,
- (At the jobsite) spray demonstration and safety instructions which include location of and persons designated as "bear watch"

An outline of the training content should be reviewed and approved by the Division EHS Manager and should be documented. A record of the training will be maintained at the job site, filed with the SSHSP and in the employee's training records. A sample Course Outline follows:

Course Outline

1. Bear Biology, Behavior and Body Language
2. Bear Avoidance by Awareness
3. Reacting to a Bear Encounter at different distances
4. Use of Deterrents, Active "Bear Spray" Training
5. Bear Killed in Defense of Life & Property
6. Firearms Safety Rules & Bear Defense Firearms
7. Firearms Handling, Carry Positions, Functioning
8. Summary Review of Classroom Training
9. Range Procedures & Range Safety
10. Use of Deterrents Cartridges (Cracker, Nova, Bean Bag, Rubber Bullets)
11. Lethal Force and the time to use it.
12. Live Fire and Familiarization with Firearms

SUPPLEMENTAL PROTECTION

In some areas it may be necessary (or preferred) to employ professional hunting guide services where significant possibility of encounters with wildlife exist. The PM and DEHSM will evaluate the need for supplemental protection. In addition to Weston's standard minimum qualifications for subcontractors, prospective bear and wild animal protection contractors must be able to provide evidence of competency. This evidence shall include:

- Proof of firearm safety training and;
- Proficiency with firearms and;
- Should have three or more years experience providing similar services.

In addition to the above, project managers should review insurance coverage with the Risk Management office to determine whether or not additional insurances should be required.

FIREARMS USE BY WESTON PERSONNEL OR SUBCONTRACTOR EMPLOYEES

In some situations, the Project Manager (with Corporate EHS approval) and client agreement may authorize selected employees or subcontractor employees to carry firearms.

Employees designated to carry firearms must demonstrate proficiency in firearm safety marksmanship through successful completion of a firearm safety training class administered by a Fish and Game Department, a local firearm range instructor, or other approved trainer. Personnel designated to carry firearms must be legally eligible to possess a firearm. Proof of legal eligibility will be accomplished by (1) providing an original bill of sale for a firearm from a Federal Firearms Licensee within the last three years, or (2) a criminal record check conducted by Corporate Human Resources. Subcontractor personnel will need to provide equivalent documentation.

Training will be documented and records of training will be maintained on site. At a minimum training must include:

- Animal behavior,
- Firearm handling and safety,
- Demonstrated marksmanship skills, and
- Safe storage of firearms and ammunition.

FIREARMS AUTHORIZED FOR SITE USE

- **Will not** be carried with a round in the chamber until a dangerous encounter is eminent, such as when a bear has been sighted in the immediate area, and
- **Must** be unloaded with a trigger lock installed when not actively being used for protection to prevent unauthorized persons from using the firearm.
- **Will** be stored in a locked case/cabinet when not required for use. Only persons qualified to use firearms will have keys to the cabinet.

Military installations require the approval of their security forces before allowing a firearm to be brought onto a military installation. In addition to base requirements, some clients (e.g. AFCEE) may require their approval. The PM must determine with sufficient lead-time whether firearm protection of employees from wild animals will be required. If such is determined to be necessary, the PM must submit a request for authorization to the Corporate EHS Director with sufficient lead-time to permit training and other steps required prior to departure for the field. All firearms and firearm-carrying personnel shall be registered and approved by the Corporate EHS Director in accordance with the project-specific approval. Copies of the project-specific approval form will be maintained in the supporting office. Incomplete requests for approval will be returned to the project manager without action; therefore, thorough planning at the project level is required to ensure that the project schedule is not impacted.

APPROPRIATE FIREARMS

Firearms that are appropriate for protection against large animals include:

- A 12-guage shotgun with rifled slugs or buck shot.
- Other firearms, such as large bore handguns or high-powered rifles, will be considered on their individual merits.

AMMUNITION

The type of ammunition to be used is best determined through consultation with local fish and game agencies or professional guide services.

- The number of rounds and type of ammunition brought to job sites shall be registered with the on-site SSHO.
- When not in use, ammunition and firearms will be effectively secured/locked up in a vehicle, cabinet, etc.

PROTECTIVE MEASURES OF LAST RESORT

When non-lethal methods of deterrence have been used and / or immediate danger to an individual exists, the wild animal may have to be killed. During project planning consult local provisions of the Defense of Life or Property Regulation in your state. In Alaska, refer to 5 AAC 92.410. After contacting the appropriate fish and game agency, the SSO must submit an incident report to the Division EHS Manager. The individual who shot the animal will make the report. In the state of Alaska, the head and the hide must be salvaged and delivered the Alaska Department of Fish and Game.

VEHICLE SAFETY

Use extreme caution, particularly in darkness, when operating vehicles in areas where wild animals may be present. Collisions with large animals have been known to cause significant property damage and personal injuries to vehicle passengers, including fatalities.

ATTACHMENT 1

BEAR SAFETY – HAZARD RECOGNITION AND PRECAUTIONS

On occasion fieldwork may be conducted in a location where bears may be encountered. The following technical information, precautions, and guidelines for operations in which bears could be encountered are based on experience and conditions for field work in the state of Alaska. Bears are intelligent, wild animals and are potentially dangerous, and would rather be left alone. The more bears are understood the less they will be feared. This attachment is intended to provide information that will enable Weston to plan for bear encounters and to properly address face-to-face encounters.

Bear Life History

Although bears are creatures of habit, they are also intelligent, and each has its own personality. The way a bear reacts is often dictated by what it has learned from its mother, the experience it has had on its own, and the instincts nature has provided. Like other intelligent animals, we can make general statements about bears, but few people can accurately predict their behavior.

Bears have an incredible sense of smell, and seem to trust it more than any other sense. Hearing and sight are also important, but to a lesser degree. A bear's hearing is probably better than ours, but not as keen as a dog's hearing. Their sight is probably comparable to that of a human. Both black and brown bears have similar life styles, although they do not usually get along with each other. Where both species occur in the same area, black bears tend to favor forested habitats while brown bears favor open areas. Since the likelihood of encountering a polar bear is remote, this procedure addresses only black and brown bears. If the project site is in an area where polar bear encounters are a possibility, consult the fish and game department for assistance in planning for encounters.

Bears are opportunists, relying on their intelligence and their senses to find food. They use different habitats throughout the year, depending on the availability of food and other necessities. The area a bear covers in a given year is partially dependent on how far it has to go to satisfy these basic needs. In some areas, individual bears have home ranges of less than a square mile; in other areas ranges can encompass hundreds of square miles. Males usually range over larger areas than females.

In spring, bears begin coming out of hibernation. Males are usually the first bears to emerge, usually in April, and females with new cubs are usually the last, sometimes as late as late June. When bears emerge from their dens, they are lethargic for the first few days, frequently sleeping near their dens and not eating. When they do start eating, they seek carrion (dead moose, caribou, sea mammals, deer, etc.), roots, and emerging vegetation. In coastal areas, beaches become travel corridors as bears seek these foods. In early summer, bears eat new grasses and forage as they develop in higher elevations. Moose and caribou calves are also important foods where they are available. In coastal areas, salmon are the most important food from June through September. This period is one of the few times that bears are found in large groups, and it is the time that most people see bears. Bears often travel, eat, and sleep along streams for weeks at a time.

Other summer foods for bears include salmonberries, grasses, forbs, ground squirrels, and occasionally, adult moose and caribou. When bears kill or scavenge large prey, they commonly cover the portions they cannot eat with sticks and duff. A bear may remain near a food cache for days and it will defend it from intruders.
During the late summer and early fall, bears move inland and consume large amounts of blueberries, elderberries, soapberries, and other succulent fruits. As the seasons progress towards winter, a bear's diet becomes more varied. This is the time that bears are adding final deposits of fat before their long winter naps.

In October and November, bears move into their denning areas and begin preparing a suitable den. Black bears usually den in holes under large trees or rock outcrops, or in small natural cavities. Brown bears usually dig their dens in steep alpine areas. Dens are just large enough for the bears to squeeze into. Bears rarely eat, drink, urinate, or defecate while they are denning. They sleep deeply, but do not truly hibernate, and they can be awakened by loud noises or disturbances.

Cubs are born in the den, usually in January. Black bear cubs usually stay with their mothers for a year and a half, and brown bear cubs usually stay with their mothers for 2.5 to 3.5 years. Black bears are sexually mature at age 2 and brown bears are sexually mature at age 4 – 8. Mating season is in the spring (May or June) and both species are polygamous (multiple mates). Both black and brown bears can live for 25 – 30 years, although most live less than 20 years.

BEAR AND HUMAN INTERACTIONS

Bears generally prefer to be left alone, but they share their homes with other creatures, including humans, who intrude on virtually every aspect of the bear's life. Bears are normally tolerant of these activities and generally find a secure way to avoid them. Humans can help bears make a graceful retreat and avoid many close encounters by letting them know we are coming. Walking in groups, talking, and wearing noise making devices, such as bear bells, all serve to warn a bear of your approach. When possible, avoid hiking and camping in areas where bears are common, such as bear trails through heavy brush or along salmon streams. Always keep an eye out for bears and bear signs. If you happen upon a dead animal, especially one that is covered with sticks and duff (a bear cache), immediately retreat the way you came, but do not run, and make a detour around the area. If you see a cub up a tree or a small bear walking alone, immediately retreat and detour around the area. Like all young animals, cubs wander away from their mothers, but females are furiously protective when they believe their cubs are threatened. Even if we do everything possible to avoid meeting a bear, sometimes bears come to us.

Bears are both intelligent and opportunistic, and they express these qualities through their curiosity. This curiosity frequently brings them into "human habitat." When this happens, we often feel vulnerable, and the bear is sometimes viewed as a threat or nuisance. In most cases, a curious bear will investigate a "human sign," perhaps test it out (chew on a raft, bite into some cans, etc.), and leave, never to return. If the bear was rewarded during his investigation by finding something to eat, it is hard to stop them from returning once they have had a food-reward. That is why we emphasize the importance of keeping human food and garbage away from bears. When in bear country, always think about the way you store, cook, and dispose of your food. **Never feed bears!** This is both illegal and foolish. Food should be stored in airtight containers, preferably away from living and sleeping areas. Garbage should be thoroughly incinerated as soon as possible. Fish and game should be cleaned well away from camp, and clothing that smells of fish and game should be stored away from sleeping areas. Menstruating women should take extra precautions to keep themselves as clean as possible and soiled tampons and pads should be treated as another form of organic garbage. Once a bear has obtained food from people, it may continue to frequent areas occupied by people. If a bear does not find food or garbage after the next few tries, it may give up and move back into a more natural feeding pattern. Occasionally, though, the bear will continue to seek human foods and can become a "problem bear." Some bears become bold enough to raid campsites and break into cabins to search for human food. Shooting bears in the rump with cracker shells, flares, rubber bullets, and birdshot are common methods of "aversive conditioning." These are also very dangerous techniques, because they may seriously injure a bear if not done properly and/or they may cause a bear to attack the shooter.

TYPES OF BEARS

The three most prevalent species of are bears are the black bear, the brown (grizzly) bear, and the polar bear. Each has a different life-style and somewhat different behavior pattern.

Black Bear Identification: Black bears are the smallest and most abundant of the bear species in Alaska. They are five to six feet long and stand about two to three feet high at the shoulders. They weigh from 200 to 500 pounds. While they are most commonly black, other color phases include brown (cinnamon), and, rarely, gray (blue), and white. Muzzles are usually brown. Black bears can be distinguished from brown bears by:

- Their head shape (a black bear's nose is straight in profile, a brown bear's is dished);
- Their claws (black bear's claws are curved and smaller, brown bears are relatively straight and longer);
- Their body shape (when standing, a black bear's rump seems to be higher than its shoulders; a brown bear's shoulders are usually higher than its rump); and
- By their ears (a black bear's ears are more prominent than a brown bear's ears). Range in Alaska Black bears live throughout Alaska, except on Kodiak Islands, the Alaska Peninsula, some islands, and the extreme northern and western portion of the state.

Typical Habitat: Black bears occupy a wide range of habitats, but seem to be most common in forested areas. Black bears are not uncommon in and around human settlements in Alaska.
Brown Bear Identification: Brown and grizzly bears are the same species. They can be over eight feet long and stand five feet high at the shoulder. Weights are typically 600 to 800 pounds, but can reach 1500 pounds. Colors range from blonde to dark brown. Coastal bears (referred to as brown bears) are the largest land carnivores and are usually medium-to-dark brown in color. Interior bears (referred to as grizzly bears) are smaller

and usually have light tips on their hair, giving them a grizzled appearance. A brown bear's muzzle is the same color as its body. Cubs frequently have a white collar around their neck and shoulders. The dished-face and large shoulder hump are distinguishing features of the brown bear.
Range in Alaska: Brown bears live throughout Alaska, except for the southern portion of the panhandle in southeastern Alaska, and on the Aleutians, and some other islands. Biologists estimate that there are from 30,000 and 45,000 brown bears in the state, and in most areas the numbers are stable. Highest densities occur on Admiralty Island, the Kodiak Islands, and the Alaska Peninsula.
Typical Habitat: Brown bears can, and do, use virtually every type of habitat. Although they are less common around human settlements than black bears, brown bears can live in close proximity to people. Polar Bear Identification
Polar Bear Identification: Polar bears are about the same size as coastal brown bears. Colors range from white to yellow. Black nose is prominent. Head shape is similar to that of a black bear, but their long tapering necks make polar bears' heads appear to be small in relation to their body size.
Range in Alaska: Polar bears are found in coastal Alaska and offshore waters from Bristol Bay to the Arctic. Ice conditions dictate local polar bear abundance.
Typical Habitat: Islands, coastlines, and waters near pack ice and ice floes, rarely occurring far inland, except for denning females, are typical habitat.

AVOIDING BEAR ENCOUNTERS WHEN

- The Bear sees you but you do not know the bear is around: The bear will likely avoid detection people and will simply move away when they sense a human.
- You see a bear and it does not know you are there: Move away slowly. Avoid intercepting the bear if it is walking. If possible, detour around the bear. If the bear is close to you, stand where you are or back away slowly. Do not act threateningly toward the bear, it may know you are there but it has chosen to ignore you as long as you are not a threat.
- You see the bear and the bear sees you: Do not act threateningly, but let the bear know you are human. Wave your arms slowly, talk in a calm voice, and walk away slowly in a lateral direction, keeping an eye on the bear. Unless you are very close to a car or a building, never run from bears. In a bear's world, when something runs it is an open invitation to chase it. Bears will chase a running object even if they have no previous intention of catching it. Bears can run as fast as a racehorse, so humans have little or no chance of outrunning a bear.
- You see a bear; the bear sees you and stands on its hind legs: This means that the bear is seeking more information. Bears stand on their hind legs to get a better look, or smell, at something they are uncertain of. It is your cue to help it figure out what you are. Help the bear by waving your arms slowly and talking to it. Standing is not a precursor to an attack. Bears do not attack on their hind legs. It is also important to remember that when a bear goes back down on all fours from a standing position, it may come towards you a few steps. This is normal, and probably not an aggressive act.

- The bear sees you, recognizes you as a human, but continues to come towards you slowly: This may mean several things, depending on the bear and the situation. It may mean that the bear does not see you as a threat, and just wants to get by you (especially if the bear is used to humans, as in a National Park); the bear wants to get food from you (if it has gotten food from people before); the bear wants to test your dominance (it views you as another bear); or may be stalking you as food (more common with black bear, but a rare occurrence). In all cases, your reaction should be to back off the trail very slowly, stand abreast if you are in a group, talk loudly, and/or use a noise-making device. If the bear continues to advance, you should stop. At this point, it is important to give the bear the message that if he continues to advance it will cost him. Continue to make loud noises and present a large visual image to the bear (standing abreast, open your coat). In bear language, bears assert themselves by showing their size. If an adult brown bear continues to come at you, climbing 20 feet or higher up a tree may also be an option if one is next to you (remember, never run from bears). Keep in mind, though, brown bear cubs and black bears can climb trees, and adult brown bears can reach 10 – 15 feet.
- The bear recognizes you as a human and acts nervous or aggressive: When bears are nervous or stressed they can be extremely dangerous. This is when it is important to try to understand what is going on in the bears mind. Nervous bears growl, woof, make popping sounds with their teeth, rock back and forth on their front legs, and often stand sideways to their opponent. A universal sign of a nervous bear is excessive salivation (sometimes it looks like they have white lips). When a bear shows any of these signs, stand where you are and talk in a calm voice. Do not try to imitate bear sounds, this may only serve to confuse and further agitate the bear. If you are in a group, stand abreast. If you have a firearm available, be prepared to use it.
- The bear charges: If all other signals fail, a bear will charge. Surprisingly, most bear charges are just another form of their language. The majority of these are "bluff charges," that is; the bear stops before making contact with their opponent. There are many different types of bluff charges ranging from a loping uncertain gait to a full-blown charge. If a bear charges, stand still. If you have a firearm, take appropriate action, but remember, if a bear is wounded, a bluff charge may immediately turn into a real charge as the bear's mind shifts from an offensive mode to a defensive mode.
- The bear attacks: When all else fails, a bear may attack. Attacks may be preceded by all of the behaviors previously described or they may be sudden. Seemingly unprovoked attacks are often the result of a bear being surprised (and feeling threatened), a bear defending its food cache, or a female defending her cubs. When a bear attacks, it typically runs with its body low to the ground, legs are stiff, ears are flattened, hair on the nape of the neck is up, and the bear moves in a fast, determined way. Front paws are often used to knock the opponent down and jaws are used to subdue it.

AFTER A BEAR ENCOUNTER

If a bear attacks you, your reaction depends on the type of bear that is attacking. If it is a black bear, fight vigorously, for your life may depend on it. Black bears have been known to view humans as prey, and if you struggle with the attacking black bear, it will probably go elsewhere for its meal.

Brown bears are a completely different story. Brown bears attack because they feel threatened, and they will continue to press the attack until the threat has been neutralized. If you fight and struggle, the bear will continue to fight, and a human has little or no chance to defeat a brown bear in battle. Lie on your face and stomach, place your hands behind your neck, and lie still when you are attacked. A brown bear will no longer see you as a threat and may stop the attack. Although it sounds foolish to play dead while being attacked by a bear, this has been proven to be the best way to survive a brown bear attack. It should be noted that if you fall down and play dead before a bear actually makes contact, the bear might come over to determine what is going on. Actual maulings by bears are very rare. Alaska has more bears than anywhere else in the world, and there are hundreds of thousands of people living, working, and playing in these bears' back yard. Yet, since 1900, there have only been an average of about two people per year mauled by bears in the state, and very few of those instances have resulted in death.

As a last resort, a bear may have to be shot. When this is the only option, it will likely be in a situation that has a sudden onset. Therefore, it is important that you are familiar and comfortable with whatever firearm you decide to carry. Remember that if you wound a bear, you make the situation worse. There is an on-going debate as to what is the best firearm to use for protection from bears. The following are a few of the pros and cons for some of the more popular firearms:

- Pistols: Convenient to carry, always with the person, can be used in close quarters during an attack, rapid-fire is possible. However, are dangerous to humans (accidents), much practice is needed to be proficient; may not be powerful enough to stop a large bear.
- Shotguns: Can be loaded with a variety of projectiles, effective at close range in brushy situations, rapid-fire is possible, easy to use. They are however inaccurate and ineffective at medium to long range, heavy to carry, potentially dangerous to humans, may not be powerful enough to stop a large bear.
- Rifles: Very powerful calibers are available, accurate at both close and long range. However, practice is required for accuracy in an emergency, range of bullet makes it dangerous to humans, heavy and awkward to carry, and rapid fire is difficult with bolt action rifles.

There are different thoughts as to the best place to shoot a charging bear. In reality, a person usually has little time to contemplate shot placement in a true bear attack. If you have a choice, it is best to aim at the shoulder and chest area. Bear's skulls are thick and covered with large muscles, so headshots may not be effective. Once you have made the decision to shoot a bear, you have a responsibility to finish the job you have started. Keep firing until you are out of bullets or you are positive the bear is dead. A wounded bear can be dangerous to you and anyone else who comes into the area.

- Bear Sprays: Are easy to carry and use, little risk of permanent damage to bears and humans, effective in many situations. However, using a spray may change a false charge into a real charge, they are ineffective at ranges greater than 20 feet, ineffective in windy conditions, dangerous if accidentally discharged in a closed area such as an aircraft cockpit.

Regardless of the firearm you choose, it is imperative that you realize that the most effective tool you have against an attacking bear is your brain. Although bears are intelligent animals, we are smarter and can often think our way out of a bad situation if we try. We must never let the firearm we carry become a replacement for common sense.

LAWS CONCERNING BEAR/HUMAN INTERACTIONS IN ALASKA

There are two regulations governing bear and human interactions in Alaska. The first, ACC 92.230, prohibits feeding bears or leaving garbage that attracts them. The other, 5 ACC 92.410, sets guidelines for taking a bear in defense of your life or property (DLP). These DLP provisions specifically state that a bear cannot be killed legally if the problem is caused by the improper disposal of garbage or some other attractive nuisance, or if it is brought about by harassment or provocation of the animal or an unreasonable invasion of its habitat.

The regulation also defines what is considered "property." If a bear is killed under the DLP provisions, the hide and skull are the property of the state and must be turned over to Fish and Game as soon as possible. The person who shot the bear is also required to submit a written incident report within 15 days

ATTACHMENT 2

HAZARDS AND PRECAUTIONS – MOOSE, ELK, AND DEER

On occasion fieldwork may be conducted in a location where moose may be encountered. The following technical information, precautions, and guidelines for operations in which Moose, Elk, or Deer may be encountered are based on experience and conditions for field work in the state of Alaska. The more these species are understood, the easier it will be to avoid contact with them thus preventing injury to ourselves and to the animals. All big game species are unpredictable and can be dangerous under certain conditions. This attachment is intended to provide information that will enable Weston to plan for encounters and to properly address face-to-face encounters.

MOOSE

Moose are the world's largest members of the deer family. The Alaska race is the largest of all the moose. Moose are generally associated with northern forest in North America, Europe, and Russia. In Alaska, they occur in suitable habitat from the Stikine River in the Panhandle to the Colville River on the Arctic Slope, and as far south on the Alaska Peninsula as Herendeen bay. They are most abundant in recently burned areas that contain willow and birch shrubs, on timberline plateaus, and along the major rivers of South-central and interior Alaska. General Description
Moose are long-legged and heavy-bodied with a drooping nose, with a "bell" or dewlap under the chin, and a small tail. Their color ranges from golden brown to almost black, depending on the season and the age of the animal. The hair of newborn calves is generally red-brown, fading to a lighter rust color within a few weeks. Newborn calves weigh 28 to 35 pounds and within five months grow to over 300 pounds. Males in prime condition weigh from 1,200 to 1,600 pounds. Adult females weigh 800 to 1,300 pounds. Only the bull has antlers.

Life History: Cow moose generally breed at 28 months, though some may breed as young as 16 months. Calves are born anytime from mid-May to early June. Cows give birth to twins 15 to 75 percent of the time, and triplets may occur once in every 1,000 births. The incidence of twinning is directly related to range conditions. A cow moose defends her newborn calf vigorously. Calves begin taking solid food a few days after birth. They are weaned in the fall at the time the mother is breeding again. The maternal bond is generally maintained until calves are 12 months old at which time the mother aggressively chases her offspring from the immediate area just before she gives birth. By late October, adult males have exhausted their summer accumulation of fat and their desire for female company. Once again, they begin feeding. Antlers are shed as early as November, but mostly in December and January.

Food Habits: During fall and winter, moose consume large quantities of willow, birch, and aspen twigs. In some areas, moose actually establish a "hedge" or browse line six to eight feet above the ground by clipping most of the terminal shoots of favored food species. Spring is the time of grazing as well as browsing. Horsetail, pond weeds, and grasses. During summer, moose feed on vegetation in shallow ponds, forbs, and leaves of birch, willow, and aspen.

Movement: Most moose make seasonal movements to calving, rutting, and wintering areas. They travel from only a few miles to as many as 60 miles during these transitions.

WORKING SAFELY AROUND MOOSE

Every year someone is injured by a moose and in some cases fatalities are caused by moose attacks. Most cases of moose attack are from cows defending their calves and they are well equipped to do so. Cow moose attack with their front feet and sharp hooves; they can kill wolves and in some cases drive grizzly bears away from their offspring. Bull moose attack with their massive antlers and can do great damage in a short amount of time. One should always be alert when working in moose country. If you encounter a moose, never approach too closely. Moose will generally declare their displeasure of your presence by lowering their ears and raising their hackles (the long hair on their neck and back). Immediately retreat if you see a moose displaying this behavior. If you are about to be attacked by a moose and there are trees present, stay behind the tree. A human can move around a tree faster than a moose can. Use common sense. Avoid contact with any wild animal. Most have the ability injure a human. Never play dead if attacked by a moose. Put something substantial between you and the moose.

ROOSEVELT ELK

Roosevelt Elk are larger, slightly darker in color, and have shorter, less symmetrical yet more massive antlers than the Rocky Mountain Elk found east of the Cascade Mountains in Canada and the United States.

General Description: Elk are members of the deer family and share many physical traits with deer, moose, and caribou. They are much larger than deer, but not as large as moose, which occur in Alaska. Distinguishing features include a large yellowish rump patch, a grayish to brownish body, and dark brown legs and neck. Unlike some members of the deer family, both sexes have upper canine teeth. The males have antlers, which in prime bull are very large, sweeping gracefully back over the shoulders with spikes pointing forward. Alaska elk antlers have a tendency toward crowning, the formation of the three points at the end of each antler. Elk shed their antlers during the winter each year and grow new ones the following summer. The soft growing antler is covered with velvet, which is scraped off by rubbing and jousting after the antlers harden in the fall. Bull elk on Afognak Island are estimated to weigh up to 1,300 pounds. Cow elk are similar in appearance to the bulls, but are smaller and have no antlers.

Life History: Elk calves are born in late May or early June when abundant food is available for the mother and the mild weather increases the calves' chances for survival. Birth usually occurs under the cover of dense spruce forest, hidden from predators and protected from the elements. Calves are born with protective coloration (light spotted areas on the back, which act as camouflage). A few days after giving birth, the mother joins other cow elk with calves. A single cow will often "baby-sit" with the calves while the remaining cows seek food. As summer progresses, elk bands move above timberline and feed on the alpine slopes where breezes keep biting insects at bay and young plants are highly nutritious. By July, the calves, although still nursing, begin feeding on succulent forbs.

Beginning in August, bands of elk congregate and form herds consisting of cows, calves, yearlings, and an occasional mature bull. Nearby, but separate from the heard mature bulls can be found. During September, the bulls join the main herds and mating activities (the rut) begin. Large herds are scenes of vigorous activity as mature bulls challenge each other vocally, emitting a high-pitched whistle or bugle, an eerie but thrilling sound. Occasionally, pushing and shoving matches are initiated as the mature bull attempt to take advantage of the larger bull's preoccupation and run past them to win the favors of a female. By mid-October most breeding activities have ceased. Herds may begin to disperse into smaller bands as they move into wintering areas. Winter months are spent in lower valleys and in the dense spruce forest and small openings near the coastline searching for food.

Food: Elk are hardy animals whose large body size and herding tendencies require tremendous amounts of food. From late spring to early fall, with a wide variety of food available, elk are mainly grazers, using grasses, forbs, and other leafy vegetation. By late fall they become browsers, feeding on sprouts and branches of shrubs and trees.
Population: From the original eight transplanted animals, Afognak elk have expanded to about 1,200.

WORKING SAFELY AROUND ELK

Although elk are not as widely distributed as moose in Alaska, they are large and potentially dangerous when the bulls are in the rut and when you may be near cows with young calves. Follow the same precautions as set forth above for moose. Elk bulls have a tendency to be more aggressive during the rut (September & October) than either moose or deer, and caution should be used when working near bulls during this time of year. Aggressive cows with calves should be avoided as well, since they attack in the same manner as cow moose.

SITKA BLACK-TAILED DEER, MULE DEER, AND WHITE-TAILED DEER

The Sitka black-tailed deer is native to the wet coastal rain forest of Southeast Alaska and north coastal British Columbia. Transplants have expanded its range and established populations now also exist near Yakutat, in Prince William Sound, as well as Kodiak, and Afognak, and Raspberry Islands.

General Description: The Sitka black tailed deer is smaller, stockier, and has a shorter face than other members of the black-tailed group. Fawns are born in early June and weigh six to eight pounds at birth. The average October live weight of adults is about 80 pounds for does and 120 pounds for bucks, although dressed weight bucks of over 200 pounds have been reported. The summer coat of reddish brown is replaced by dark brownish gray in winter. Antlers are dark brown with typical black tailed branching. Normal adult antler development is three points on each side. Average life span is about 10 years, but a few are known to have attained an age of at least 15.

Life History: Fawns are born in late spring. After the winter snow pack recedes, deer disperse; migratory deer move to high elevation alpine/sub-alpine habitats while resident deer remain at lower elevations throughout the forest. Summer and early fall are periods of active foraging as deer accumulate fat reserves, which will help them through the winter and early spring. With the first heavy frost, deer in the higher alpine and sub-alpine areas descend to the upper forest. The breeding season (or rut) peaks during late November. Breeding bucks spend little time foraging and by late November have used up much of their fat reserve. Does, however, generally enter December in prime condition. Does breed during their second year of life and continue producing fawns annually until they are 10 or 12 years of age. Reproductive success decreases rapidly beyond 10 to 12 years and by age 15, which is probably the maximum life expectancy, reproduction has essentially ceased. Prime age does (5 to 10 years) typically produce two fawns annually.

Throughout the rest of the winter and early spring, deer are generally restricted to uneven-aged old growth forest below 1,500 feet in elevation. The old growth forest provides optimal winter habitat because the high broken canopy intercept much snow but still provides enough light for the growth of forage plants used by deer. During winter, the distribution of deer at various elevations is influenced by changing snow depth. During extreme snow accumulations, many deer congregate in heavily timbered stands at lower elevations, and some may even move into the beach. Spring is a critical period for deer, and if winters are deep and persistent, many deer die of starvation. As snow melts in mid to late spring, deer begin to disperse, and by late spring and early summer they start rebuilding some of the fat reserves lost during winter.

Home Range: Summer and winter home range areas vary from 30 to 1,200 acres and average about 200 acres for radio-collared deer on Admiralty Island. Migratory deer have larger annual home ranges than resident deer. The average distance between summer and winter home ranges is five miles for migratory deer and half a mile for resident deer. Movement of deer between watersheds appears to be minimal during winter.

Food Habits: During summer, deer generally feed on herbaceous vegetation and the green leaves of shrubs. During winter, they are restricted to evergreen forbs and woody browse. When snow is not a problem, evergreen forbs such as bunchberry and trailing bramble are preferred. During periods of deep snow, woody browse such as blueberry, yellow cedar and hemlock, and arboreal lichens are used. Woody browse alone, however, is not an adequate diet and deer rapidly deplete their energy reserves when restricted to such forage.

Populations: Deer populations in Alaska are dynamic and fluctuate considerably with the severity of the winters. When winters are mild, deer numbers generally increase. Periodically, however, a severe winter will cause a major decline in the population. Deer have a high reproductive potential, and depressed populations normally recover rapidly. In some cases, however, predation may speed deer decline, as well as slow recovery to higher levels. The wolf, which occurs on the mainland and islands south of Frederick Sound, is considered the major predator of deer in Southeast Alaska. Both black and brown bears also prey on deer to some degree.

WORKING SAFELY AROUND DEER

The White-tailed deer found thought the eastern and western part of the United States have been known to attack people on many occasions. It is unknown whether Black-tailed deer have made any such attacks, but it is possible for someone to be injured by an irate buck in the breeding season (late fall). Deer are well equipped to injure humans. They are very fast. Bucks have sharp antlers and can clear amazingly high obstacles with graceful, arching leaps. They can run with remarkable speed, even in dense cover, and have excellent camouflage. When working in areas populated with deer, whether it is White-tailed, Black-tailed, or Mule deer, it is just common sense not to approach any large wild animal too closely. It is unlikely that an attack from a deer would be fatal but it is possible and serious injury is likely.

ATTACHMENT 3

AMERICAN BISON AND FERAL WILD CATTLE – HAZARD RECOGNITION AND PRECAUTIONS

American Bison (Bison), which shaped the lifestyle of the plains Indians and figured prominently in American history before they were brought to near extinction, were transplanted to Alaska from Montana in 1928. While bison were the most common large land mammal in Alaska thousands of years ago, all of Alaska's wild bison came from 20 animals released near Delta Junction. Natural emigration and transplants have now created additional herds at Copper River, Chitina River, and Farewell. Small domestic herds are located at Healy, Kodiak Island, and on Provo Island. There were approximately 700 wild bison in the state in mid-1985.

General Description: The bison is the largest native land mammal in North America. A full-grown bull stands six feet at the shoulder, is up to 10 feet long, and can weigh more than a ton. Full-grown cows are smaller, but have been known to weigh over 1,200 pounds. A bison's head and forequarters are massive and seem out of proportion to the smaller hind parts. Bison have vertebrae, which begins just ahead of the hips and reaches its maximum height above the front shoulder. From above the shoulder, the hump drops almost straight down to the neck. The bison's horns curve upward. The horns of the bull are larger and heavier than the horns of the cow. As winter progresses, their coats change color and are much paler by spring. When the weather warms, the hair loosens and hangs in patches until it is completely shed and replaced with new hair by late spring. Hair on the chin resembles a goatee. Older animals tend to have more hair on their heads.

Life History: Most bison young are born in May, but calves are born from April to August or even later. Newly born calves have a reddish coat. They are able to stand when only 30 minutes old; within three hours of birth, they can run and kick their hind legs in the air. At about 6 days of age, calves start grazing. Their reddish-orange coat begins to darken at about 10 weeks, with the molt to dark brown complete about five weeks later. Cows are sexually mature at two years of age and give birth to single calves twice in three years. The gestation period is approximately 270 days. On rare occasions, a mostly white or even albino calf has been born in the Delta herd, but none has reached maturity. Bison in Alaska have been known to live to a relatively great age compared to other hoofed animals (ungulates). One tagged bull killed in the Copper River area was over 20 years old. Bison are migratory animals by nature. Alaska's wild bison do not remain in single herds, but scatter alone or in-groups ranging up to 50 animals or more. In the Delta Junction area, they move far up the Delta River in early spring to secluded meadows where they calve. Around August they travel back downstream, eventually moving on the Delta Junction Bison Range, and finally in late fall, onto farms where they remain throughout the winter. Here they sometimes cause damage to un-harvested crops. Alaska's other wild bison herds also have seasonal movement patterns. Bison move slowly while feeding and appear to be quite clumsy. This is pure deception, for when pursued, the bison is fleet of foot and has great endurance. A mature bull eventually captured at Delta Junction jumped a seven-foot log fence from a standing position.

Food Habits: Bison are grazing animals and in Alaska find only limited amounts of food along rivers, in recent burns, and sedge potholes. Their diet is made up mainly of various grasses and forbs like vetch, a favored summer food found on gravel bars. Sedges, silverberry, willow, and ground birch are also eaten.

Working Safely Around Bison: When working in areas where bison are present, follow the same precautions as stated above for other large potentially dangerous wild animal. Generally, where bison are present there also will be moose and Brown (Grizzly) bears sharing the same area. Partially due to the relatively sparse population, bison injure fewer people than Brown Bears or moose. Never approach bison and use caution when working near bison as they are unpredictable and can cover a lot of ground in a short amount of time. Bison can be found in timbered areas. If approached by a bison and you cannot make it to a vehicle, keep a large tree between you and the bison. You can move around the tree faster than the bison. If a single bison or heard of bison approach you or your crew, retreat to your vehicle and leave the area. Do not attempt to "drive" the bison from your area while in your vehicle. Bison have no respect for cars and could charge and damage your vehicle and the occupants. The best way to avoid contact is to use your head and give the bison the right of way.

FERAL OR WILD CATTLE

Feral or wild cattle are only found in a few remote locations in Alaska. A population exists on Sitkinak Island on the south end of Kodiak Island, Long Island, Harvester Island, and Chirikof Island. The same caution should be used when working in areas with a population of wild cattle that would be used when working around any of Alaska's dangerous wildlife. Never approach too closely and if they begin to approach you, clear the area as fast as possible. If you arrive at your work site and there are wild cattle close by, stay in you vehicle and remain there until they leave the area. If it is necessary to destroy a wild cow, you must notify the Department of Fish & Game. The same Defense of Life and Property (DLP) law that applies to big game species does not apply to wild domestic cattle, but you will be required to salvage the meat and make the report. Cattle reside on leased ground, and the owner of the leases must also be notified. It may also be necessary to compensate the landowner.

Wild Feral Cattle can be dangerous, and there are reports of injuries to people. Although they may look domestic cattle, they are wild and have no fear or respect for humans. Give them the right a way, use common sense, and maintain a safe distance when working where wild Feral Cattle inhabit the area.

ATTACHMENT 4

MOUNTAIN LIONS (COUGARS) – HAZARD RECOGNITION AND PRECAUTIONS

Mountain lions range throughout the Western United States and are the largest cat in North America, weighing considerably more than its cousins — the lynx, bobcat and domestic cat. Sleek and graceful, the cougar is a solitary and secretive animal rarely seen in the wild. However, in many areas humans are encroaching on wildlife habitat and cougar numbers are rebounding, the number of cougar sightings in suburban areas is on the rise

COUGAR COUNTRY

Cougars prefer rocky terrain, dense brush and semi-open forests. The other essential ingredient, of course, is deer and elk, the cougar's main prey. Traditionally, cougars were associated almost exclusively with deer and elk herds, but as cougar have expanded their range and adapted to semi-urban areas, smaller mammals like raccoons, coyotes and opossums supplement their diet.
Cougars are territorial animals and maintain home ranges of up to 100 square miles. The lions mark their territories with "scratch hills" or scrapes — leaves, grasses and dirt they rake together into small piles and urinate on. Most active at dawn and dusk, cougars are lone hunters designed for short bursts of speed. They prefer to ambush their prey and often drag their kills to secluded spots where they will eat it and then cover, or cache, the remains for later.

<u>General Description:</u> Cougar, mountain lion, puma, panther, and catamount are common names of this large predator. The cougar is a member of the cat family and have short faces, relatively small rounded ears, and retractable claws. An adult cougar's body length ranges from 42-54 inches with tails nearly 3 feet long (a third of the lion's total length). Adults range from 26-31 inches tall at the shoulder. Adult males can weigh up to 200 pounds, adult females up to 120 pounds. Cougars vary in color from reddish-brown to tawny to gray with a black tip on their tail. Kittens have black spots.

<u>Range/Habitat</u>: Cougars prefer rocky terrain, steep slopes and cliffs, rim rock, dense brush and semi-open forests — essentially the same general range as its prey species, the deer, elk, mountain goat and wild sheep. Over 20,000 cougars are thought to live in the Western United States.

Cougars are primarily crepuscular (active at dawn and dusk) and secretive animals. Adults, particularly the males, roam widely often covering a home range of 75-100 square miles. The lions are territorial and will "mark" their territories by urinating on scratch piles. They den in rock outcroppings, dense thickets and under uprooted trees.

<u>Food:</u> Cougars are carnivores, meaning they eat mainly meat. Their diet consists primarily of deer and elk. Mountain goat, wild sheep, moose, coyotes, porcupine, raccoons, beaver, hares, rodents, and occasionally, domestic animals all supplement their diet. Cougars will cache uneaten portions of their kill or cover it for later consumption, but will not eat spoiled meat, as bears will.

Life span: Cougars 8-12 years are considered old, yet they may live up to 20 years. Cougars breed for the first time between 2 and 3 years of age. They are polygamous, meaning individuals may breed with several different cougars. The bond between male and female is short-lived and the male cougar plays no role in raising the kittens. A female's gestation period is 88-97 days (about 3 months). The animals normally breed every other year and during no particular breeding season. Females usually give birth to two kittens, but litters may range from one to six kittens, and may be born any month of the year. Newborns are 8-12 inches long and weigh less than a pound. Kittens remain with their mother for a year and a half.

COUGARS: CLOSE ENCOUNTERS

Cougar attacks on humans are extremely rare. In North America, fewer than 20 fatalities and 75 non-fatal attacks have been reported during the past 100 years. However, more cougar attacks have been reported in the western United States and Canada over the past 20 years than in the previous 80. In Washington, of the one fatality and five non-fatal attacks reported since 1924, four attacks have occurred during the 1990's. As cougar numbers increase in Washington and habitat dwindles, the more likely you are to encounter a lion. Young, newly independent cougars of 1 or 2 years of age, presumably having difficulty finding food for themselves, account for the majority of the cougar/human interactions reported in Washington.

IN COUGAR COUNTRY (ESPECIALLY WOODED FOOTHILLS):

- Keep pets indoors or in secure kennels at night for safety.
- If practical, bring farm animals into enclosed sheds or barns at night, especially during calving or lambing seasons.
- Do not leave pet food or food scraps outside.
- Store garbage in cans with tight-fitting lids so odors do not attract small mammals.
- When children are playing outdoors, closely supervise them and be sure they are indoors by dusk.
- Light walkways and remove any heavy vegetation or landscaping near the house.
- Avoid feeding wildlife or landscaping with shrubs and plants that deer prefer to eat. Remember, predators follow prey.

While recreating or working in cougar country you can avoid close encounters by taking the following precautions:

- Work or hike in small groups and make enough noise to prevent surprising a cougar. Avoid hiking alone.
- Keep small children close to the group, preferably in plain sight just ahead of you.
- Do not approach dead animals, especially recently killed or partially covered deer and elk.
- Be aware of your surroundings, particularly when hiking in dense cover or when sitting, crouching or lying down. Look for tracks, scratch piles, and partially covered droppings.

- Keep a clean camp. Reduce odors that may attract small mammals like raccoons, which in turn attract cougars. Store meat, other foods, pet food, and garbage in double plastic bags.
- Do not leave your pet tied at a campsite, which may also attract cougars. Better yet, leave “Rover” at home when camping or hiking.

When an Encounter Occurs

If you do come face to face with a cougar, your actions can either help or hinder a quick retreat by the lion. Here are some tips.

- Stop, stand tall and don’t run. Pick up small children immediately. Running and rapid movements may trigger an attack. Remember, a cougar’s instinct is to chase.
- Face the cougar, talk to it firmly and slowly back away. Always leave the animal an escape route.
- Try to appear larger than the cougar by getting above it. (E.g., stepping up onto a stump). If wearing a jacket, hold it open to further increase your size.
- Do not take your eyes off the animal or turn your back. Do not crouch down or try to hide.
- Never approach the animal, especially if it is near a kill or with kittens. Never corner the animal or offer it food.
- If the animal does not flee and shows signs of aggression (crouches with ears back, teeth bared, hissing, tail twitching, and hind feet pumping in preparation to jump), be more assertive. Shout, wave your arms and throw rocks. The idea is to convince the cougar that you are not prey, but a potential danger.

If the cougar attacks, fight back aggressively and try to stay on your feet. Cougars have been driven away by people who have fought back using anything within reach, including sticks, rocks, shovels, backpacks, and clothing — even your bare hands. Generally, if you are aggressive enough, a cougar will flee, realizing it has made a mistake.

ATTACHMENT 5

PROJECT- SPECIFIC APPROVAL FOR USE OF FIREARMS

In some remote locations firearms may be necessary to ensure a safe work environment. When the project manager determines that firearms are necessary a Project-Specific Approval for Use of Firearms form (attached) must be completed and submitted with the HASP. The Corporate EHS Director (or designated representative in his absence) is authorized to grant a project-specific approval.

The project-specific approval applies only to projects where firearms are required and should be omitted when other controls are deemed appropriate.

Please refer to Attachment 5A for Weston's Alaska Bear Guard Procedures.

Project-Specific Approval for Use of Firearms – Protection from Wildlife

Project Name:	End Date:
Location:	Start Date:
Contract Number:	WO No.:

Wildlife Species of Concern:

Project Narrative (Brief description of the scope of work):

Justification (Brief narrative supporting firearm exemption):

The following named personnel have demonstrated proficiency in wildlife protection through training and experience (Attach copies of training documents), have agreed to perform the duties as outlined in the HASP; and therefore are granted an exemption and permitted to possess firearms on the project site for the express purpose of wildlife protection. Proof of legal eligibility will be accomplished by providing an original bill of sale for a firearm from a Federal Firearms Licensee within the last three years, or a through a criminal record check conducted by WESTON's Human Resources Department. Subcontractors are required to provide equivalent documentation for their employees.

Employee Name	Employee Number	Company	Title	Background Check
				Pass / Fail
				Pass / Fail
				Pass / Fail
				Pass / Fail

This document when approved, grants approval to use firearms on this project for the express purpose of protection from Wildlife. All persons either employed by or subcontracted to WESTON must adhere to the requirements for safe handling of firearms and those that may be required by the client, airline companies, and any other regulatory agencies or organizations. These restrictions must be stated in the HASP.

Approvals:

Title	Name (print or type)	Signature	Date	Approved
Project Manager				Yes / No
OU Manager				Yes / No
Safety Officer				Yes / No

Statement of Compliance: The above persons approving this document have reviewed the requirements of the project and agree that the possession and use of firearms is necessary to ensure that Weston is able to ensure a safe work environment on the stated project. Only those persons named herein shall be permitted to possess firearms.

Title	Name (print or type)	Signature	Date	Approved
Division EHS Manager				Yes / No
Corporate EHS Director				Yes / No

The Division and Corporate EHS Managers have reviewed this request and hereby grant a project specific waiver.

Approval Comments: (Write comments as appropriate)
This approval does not permit or allow possession of firearms on or in vicinity of, the project location for any purpose other than protection from wildlife.

ATTACHMENT 5A

WESTON Alaska Bear Guard Procedures

Introduction

Weston Solutions, Inc. (WESTON) conducts a variety of projects across vast regions of the remote Alaska wilderness. Wildlife hazards are present across all of Alaska and have the potential to result in significant injury, or even death to humans. The most significant risk comes from encountering bears during fieldwork, the risk is especially present at remote locations, and therefore a bear guard may be necessary to protect the field team in the unlikely event that lethal force must be used. This document outlines WESTON's procedures to ensure that firearms are stored, handled, transported, and used properly.

Training Requirements

All personnel assigned to perform bear guard duties will receive the appropriate training needed to properly uphold their roles and responsibilities. All personnel assigned to carry a firearm must fill out a "Project Specific Approval for Use of Firearms" form - Attachment 5 in FLD 43A. Weston employees who are designated as bear guards are required to submit to have a Weston-initiated background check on file with Human Resources.

The WESTON bear guard will also be required to complete applicable Weston, client, project, and site specific trainings. If bear guard duties are going to occur in Polar Bear habitat then additional training and permitting must be coordinated with the United States Fish and Wildlife Service in accordance with the Endangered Species Act.

Steps of Progressive Deterrence

Lethal force should be conducted only as a last measure when needed to prevent escalation of an encounter and to ensure the safety of humans. If a bear is present at a job site, all personnel shall retreat indoors to safety if able or otherwise leave the job site, the bear shall not be harassed, regardless of hindrance of the progression of work activities. If altering an animal's behavior is the <u>only</u> way in which to ensure the safety of workers, the following steps of progressive deterrence and hazing will be followed:

1. Intimidate with size, movement, and sound (i.e. yelling, clapping, horn honking, sirens).
2. Non-lethal physical contact – Fire ammunition, such as a beanbag or fin-stabilized rounds, at bear (if authorized by permit to do so).
3. Lethal contact – Fire lethal round at bear. This can only be used in defense of human life. Example scenarios include a charging bear leaving no avenue of escape for personnel, or a bear that has already attacked a person.

Handling and Storage

Firearms and ammunition should remain in the possession of the authorized carrier for the duration of the project or field effort. The weapon may only be loaded once the crew has arrived at the site and are ready to begin fieldwork. A weapon may never be loaded while traveling in a vehicle or aircraft.

When not in use, weapons must be stored unloaded with breach open, and locked in their case. A trigger-lock or other mechanism should be installed, rendering the firearm non-functional. The ammunition will be containerized in a hard, water resistant case. Containers will be inspected by the person assigned bear hazing duties at the beginning of each shift to verify the number and types of rounds in possession.

When working at a client's facility, WESTON may be required to turn over the weapon at the end of each workday.

It is unlawful to discharge a firearm from a vehicle while the vehicle is being operated. It is unlawful to discharge a firearm from, on, or across a highway. It is unlawful to discharge a firearm with reckless disregard of damage to property or risk of physical injury to persons.

Transporting firearms

Travelers may only transport UNLOADED firearms in a locked, hard-sided container in or as checked baggage. All firearms, ammunition and firearm parts, including firearm frames and receivers, are prohibited in carry-on baggage. Airlines may have additional requirements for traveling with firearms and ammunition. Travelers shall contact the airline regarding firearm and ammunition carriage policies. Failure to adhere to the following regulations will preclude passengers from traveling with firearms, ammunitions or firearm parts:

- Travelers must declare all firearms to the airline during the ticket counter check-in process.
- The firearm must be unloaded.
- The firearm must be in a hard-sided container.
- The container must be locked. A locked container is defined as one that completel y secures the firearm from being accessed. Locked cases that can be pulled open with little effort cannot be brought aboard the aircraft.
- If firearms are not properly declared or packaged, Transportation Security Administration (TSA) will provide the bag to law enforcement for resolution with the airline. If the issue is resolved, law enforcement will release the bag to TSA so screening may be completed.
- TSA must resolve all alarms of checked luggage. If a locked container containing a firearm alarms, TSA will contact the airline, who will make a reasonable attempt to contact the owner and advise the passenger to go to the screening location. If contact is not made, the container will not be placed on the aircraft.
- If a locked container alarms during screening and is not marked as containing a declared firearm, TSA will cut the lock in order to resolve the alarm.

- Travelers should remain in the area designated by the aircraft operator or TSA representative to take the key back after the container is cleared for transportation.
- Travelers must securely pack any ammunition in fiber (such as cardboard), wood or metal boxes or other packaging specifically designed to carry small amounts of ammunition.
- Firearm magazines and ammunition clips must be securely boxed or included within a hard-sided case containing an unloaded firearm.
- Small arms ammunition, including ammunition not exceeding .75 caliber for a rifle or pistol and shotgun shells of any gauge, may be carried in the same hard-sided case as the firearm, as long as it follows the packing guidelines described above.
- TSA prohibits black powder or percussion caps used with black-powder.
- Weapons or ammunition shall never be shipped separately as cargo. Only as personal baggage.

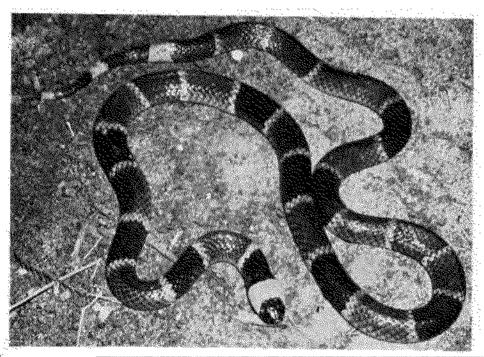
Firearms Discharge Reporting

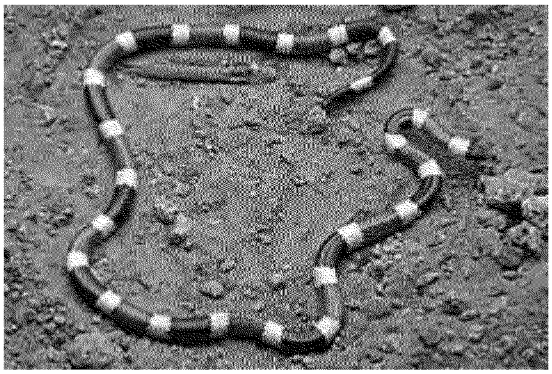
Any discharge of a firearm will be thoroughly documented and reported via a Notice of Incident (NOI). Any recoverable materials including spent shell casings, projectiles etc. will be collected and removed from the site. Any required agency notifications must be made in accordance with project permits or client requirements.

APPENDIX B - PICTURES OF POISONOUS SNAKES AND LIZARDS

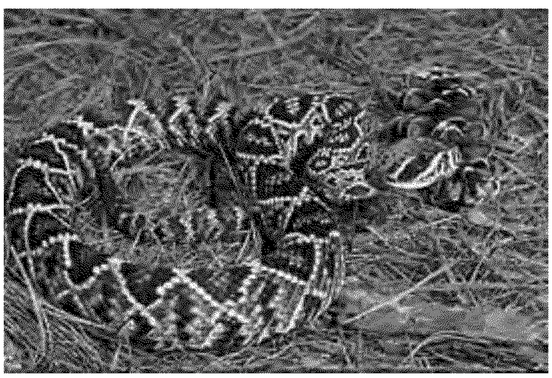
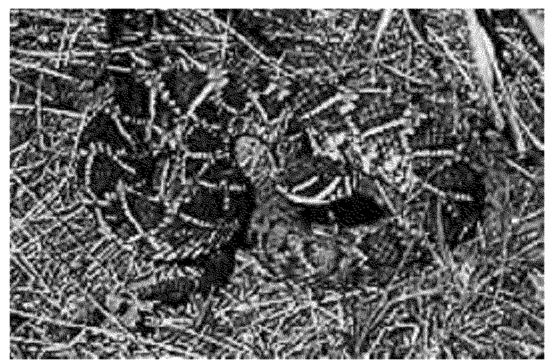
Americas

American copperhead

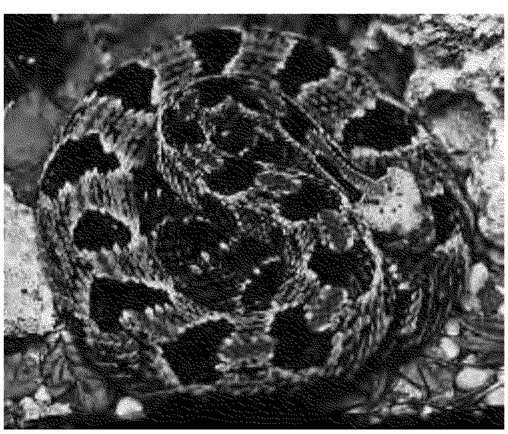
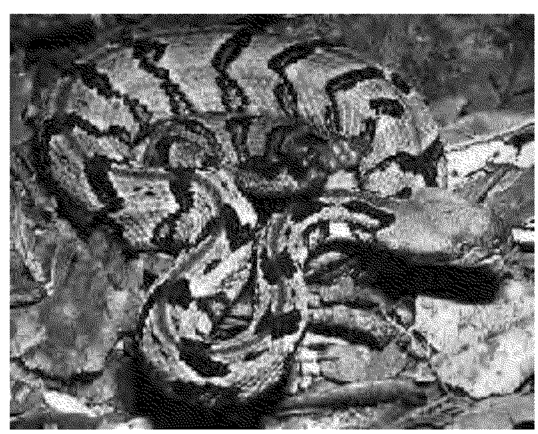


 Coral Snakes – Western, Eastern and Texas – Southern US

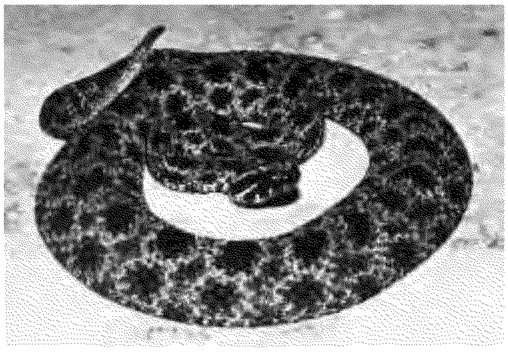

Cotton Mouth – East and Southeast US

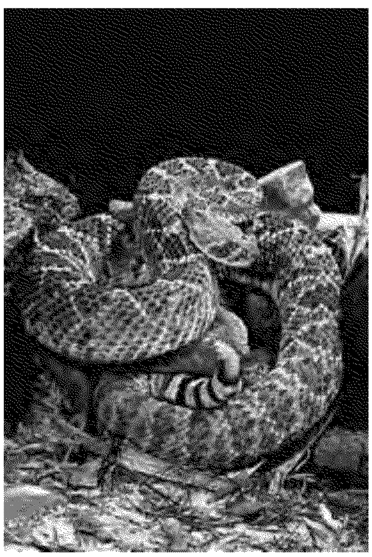
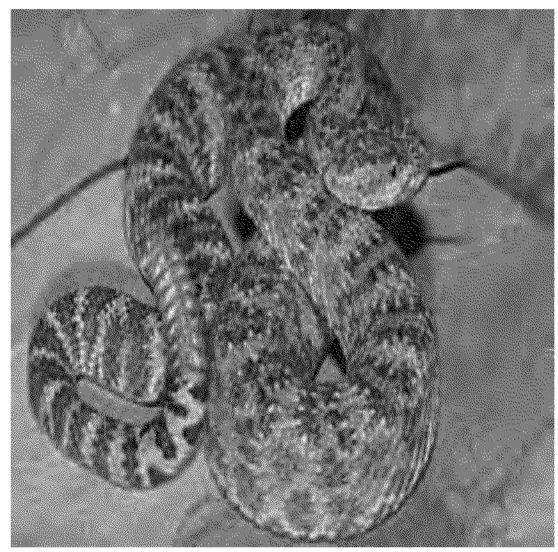
Eastern Diamondback Rattlesnake - Southeast US

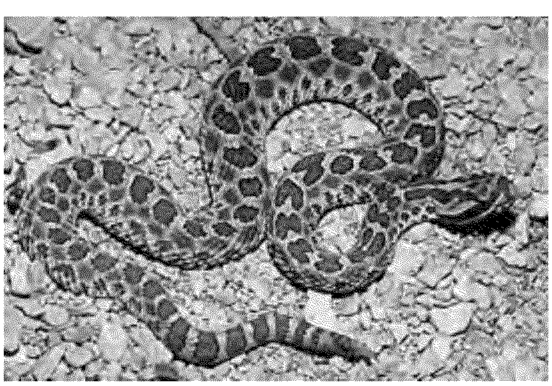
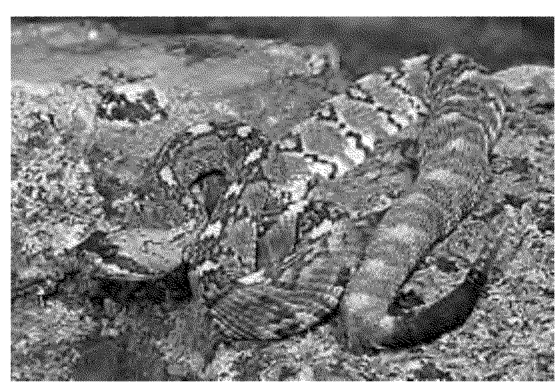
Timber Rattlesnake – Eastern US



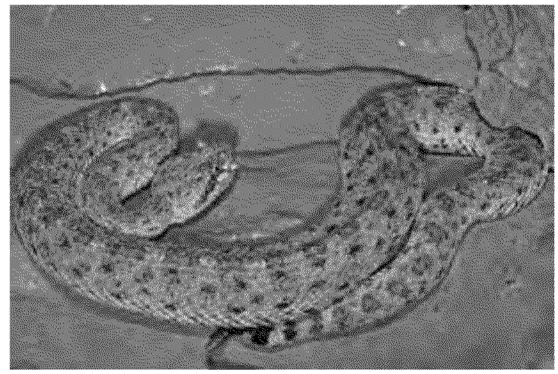

Dusky Pygmy Rattlesnake - SE US Mojave Rattlesnake – Southwest US Mexico

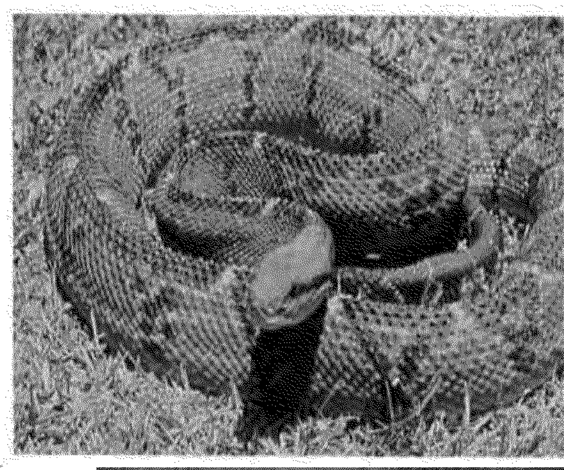
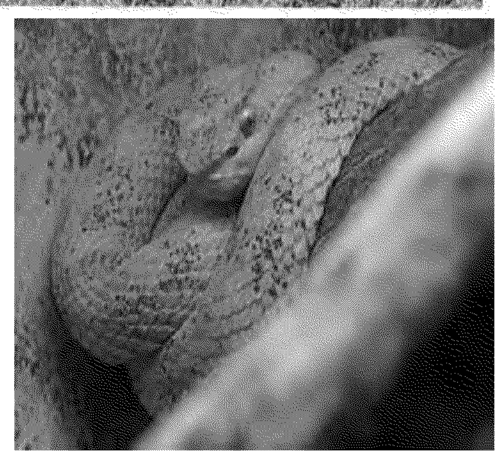
Western Diamondback Rattlesnake – SW US Speckled Rattlesnake - SW US

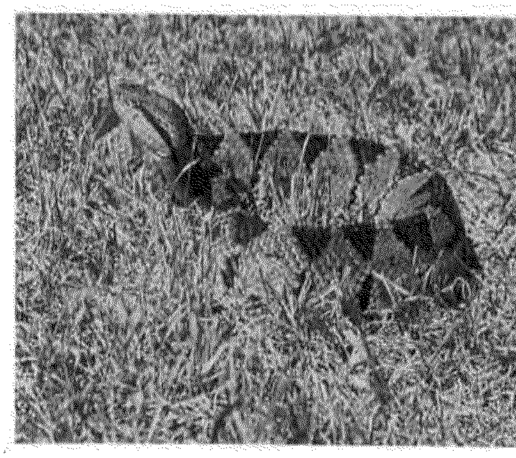
Massasaug – North and South Central US Black-tailed Rattlesnake – South Central US and Mexico

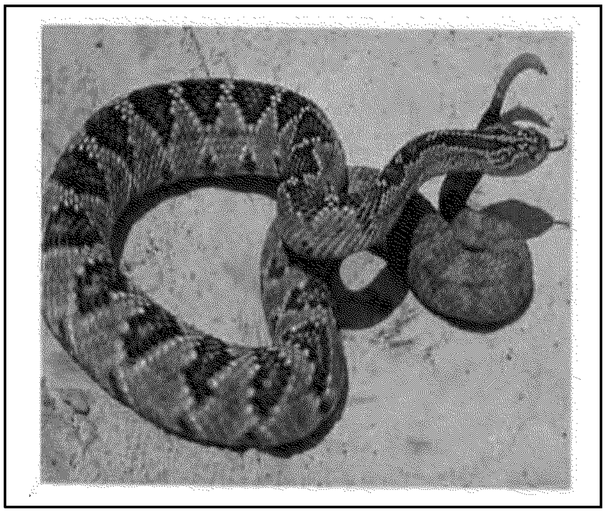
Tiger Rattlesnake – Southwest US and Mexico Sidewinder – Southwest US

Bush Master – Central and South America, Caribbean Eyelash Pit Viper



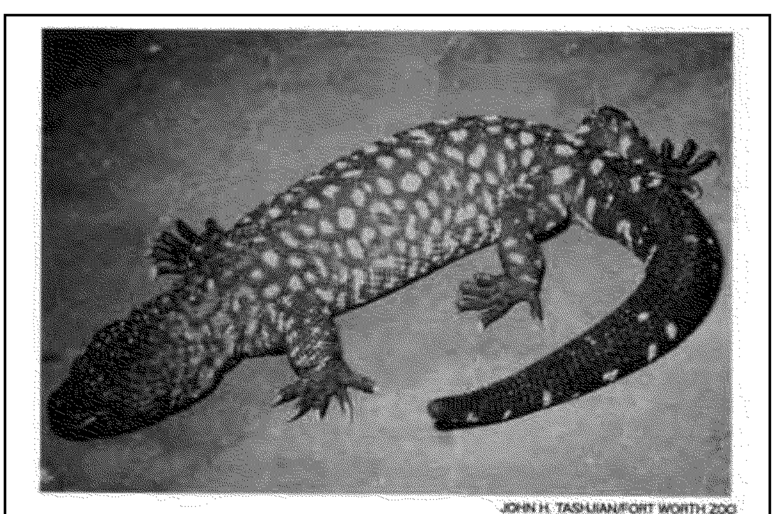
Fer-de-Lance – Central & South America Jumping Viper – Central America



Tropical rattlesnake - Southern Mexico, Central America, and South America.

Lizards

Gila Monster – SW US

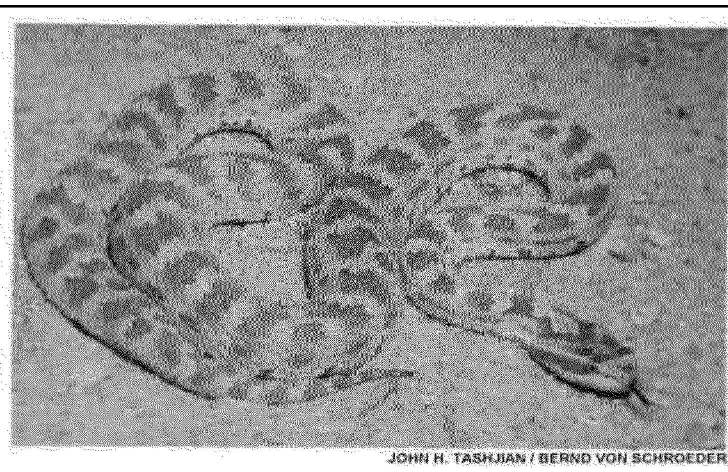


Mexican Bearded Lizard – Mexico and Central America

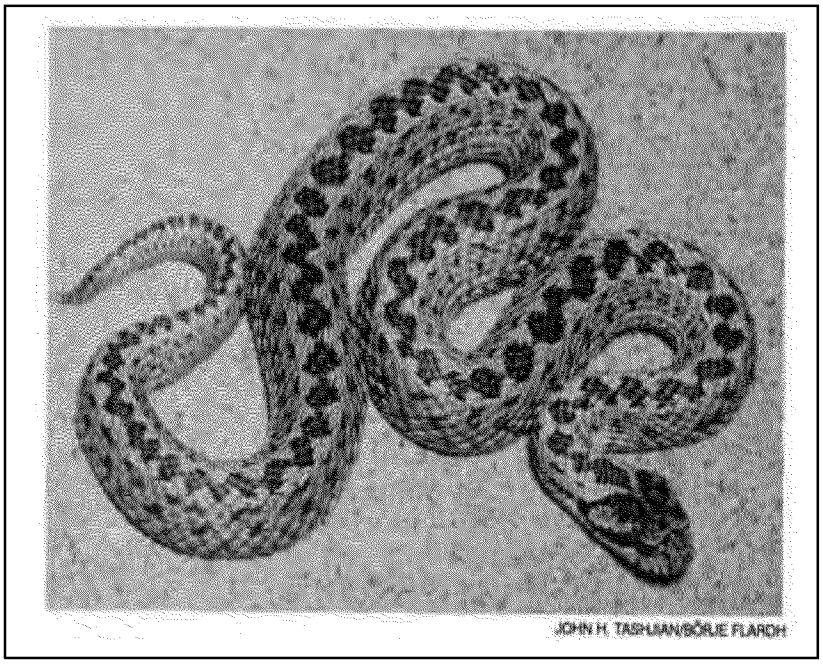
Europe

Common Adder - Throughout Europe

Long nosed Adder - Italy, Yugoslavia, northern Albania, and Romania

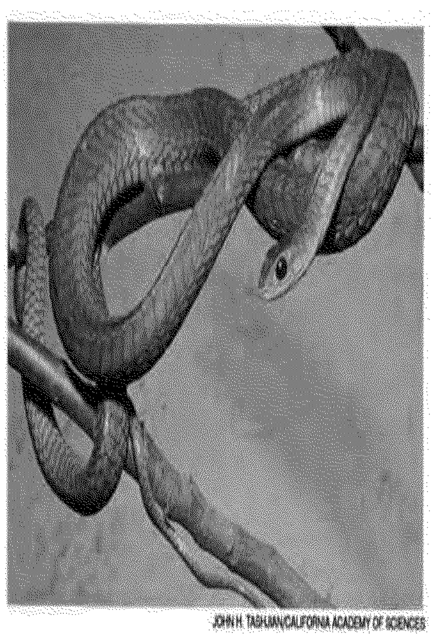


Pellas Viper - Throughout southeastern Europe.



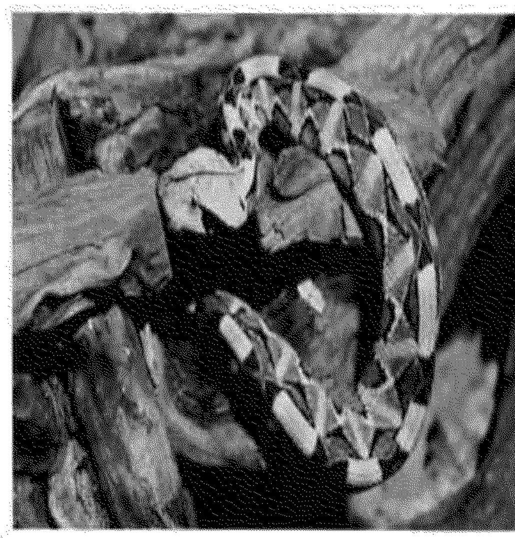
Ursini Viper - Most of Europe, Greece, Germany, Yugoslavia, France, Italy, Hungary, Romania, Bulgaria, and Albania.

Africa and Asia



Boomslang - sub-Saharan Africa

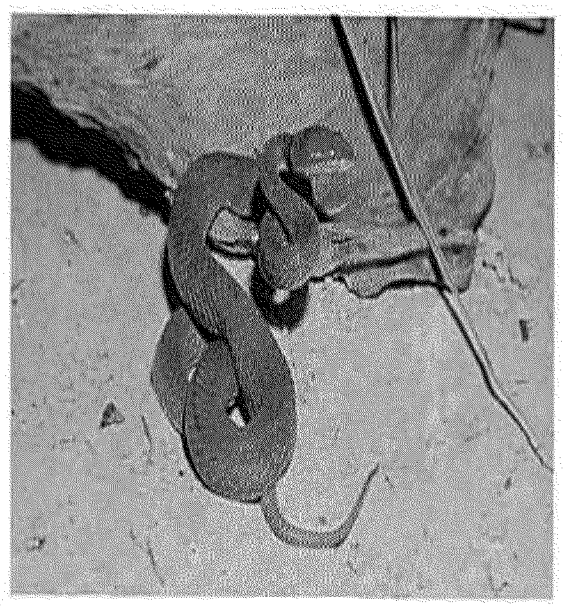
Bush Viper - Most of Africa, Angola, Cameroon, Uganda, Kenya, and Zaire

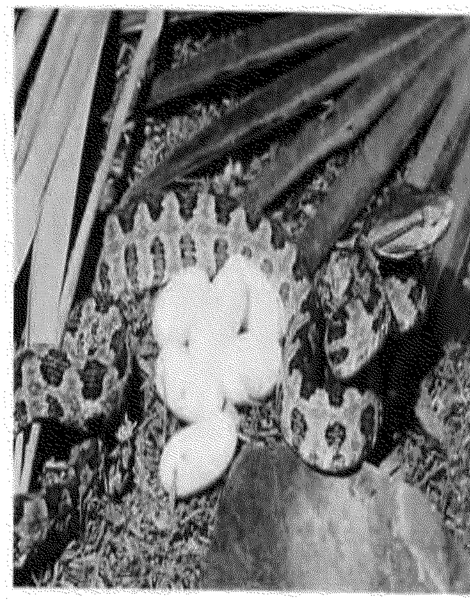


Africa, Iraq, Syria, and Saudi Arabia Gaboon viper - Most of Africa

Green Mamba - Most of Africa.

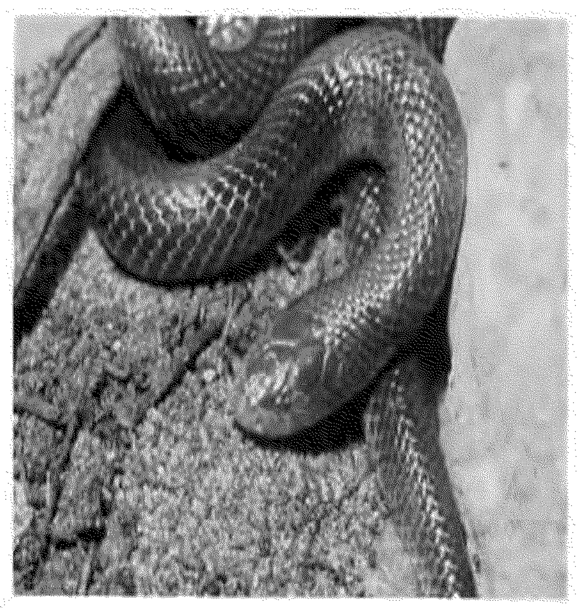
Rhinoceros viper or river jack – Equatorial Africa





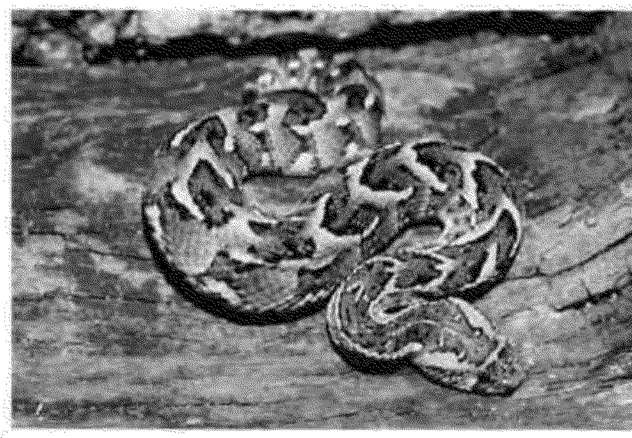
Green Tree Pit Viper - India, Burma, Malaya, Thailand, Laos, Cambodia, Vietnam, China, Indonesia, and Formosa.

Habu pit viper - Okinawa and neighboring islands and Kyushu

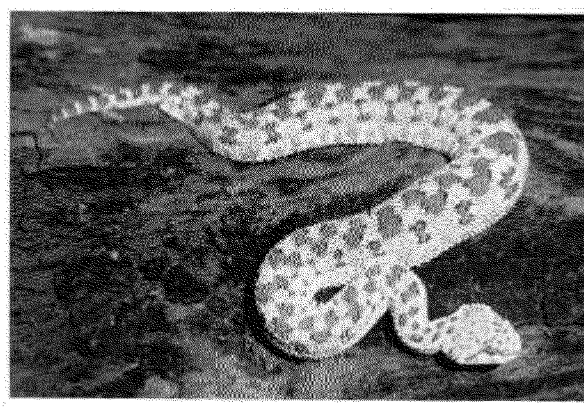


Mole or Burrowing Viper
Sudan, Ethiopia, Somaliland, Kenya, Tanganyika, Uganda, Cameroon, Niger, Congo, and Urundi.

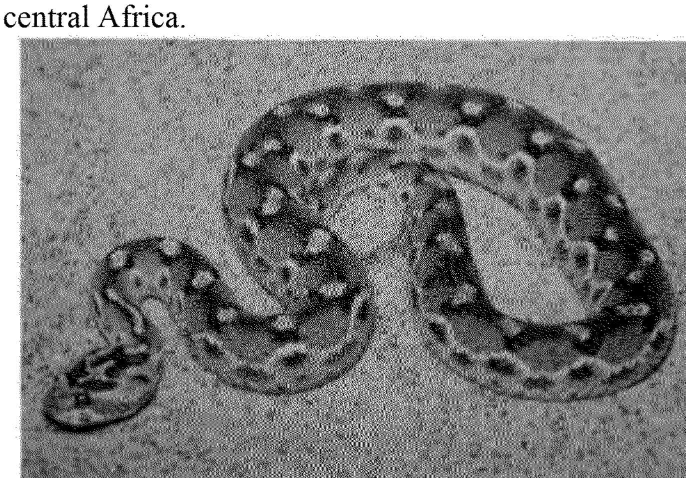
Middle East



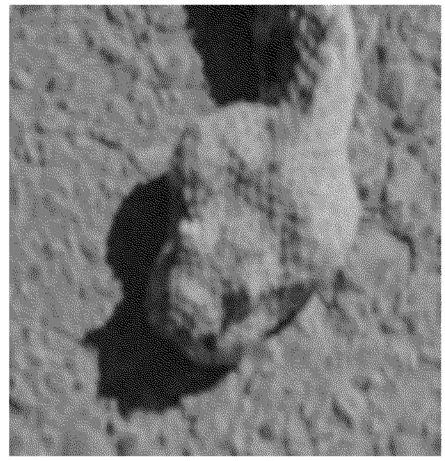
Puff Adder - Most of Africa, Saudi Arabia, Iraq, Lebanon, Israel, and Jordan



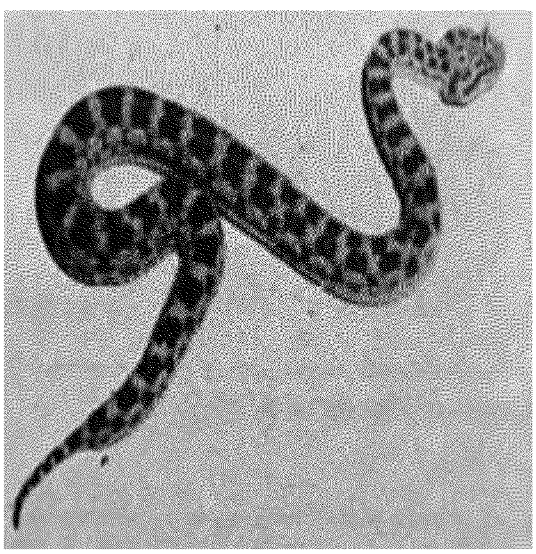
Sand Viper - Northern Sahara, Algeria, Egypt, Sudan, Nigeria, Chad, Somalia, and central Africa.



Saw Scaled Viper - Asia, Syria, India, Africa, Iraq, Iran, Saudi Arabia, Pakistan, Jordan, Lebanon, Sri Lanka, Algeria, Egypt, and Israel.

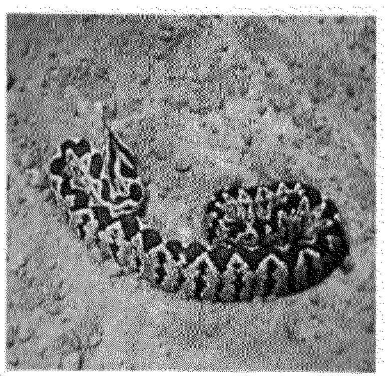
 

Field's horned viper, False Eye-horned viper - Middle East and as far east as Pakistan

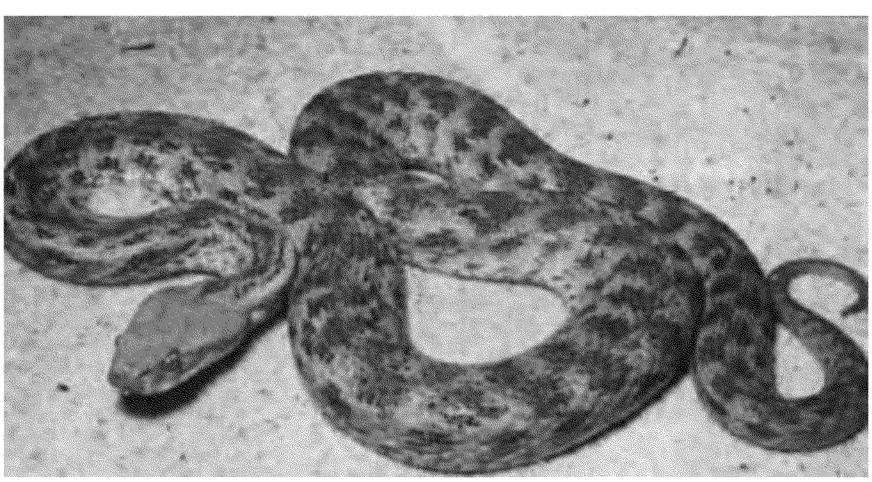
 

Horned Asp, (true) Desert Horned/Eye-Horn Viper,
desert horned sidewinder Northern Africa and parts of the Middle East.

Desert Cobra, Desert Black Snake

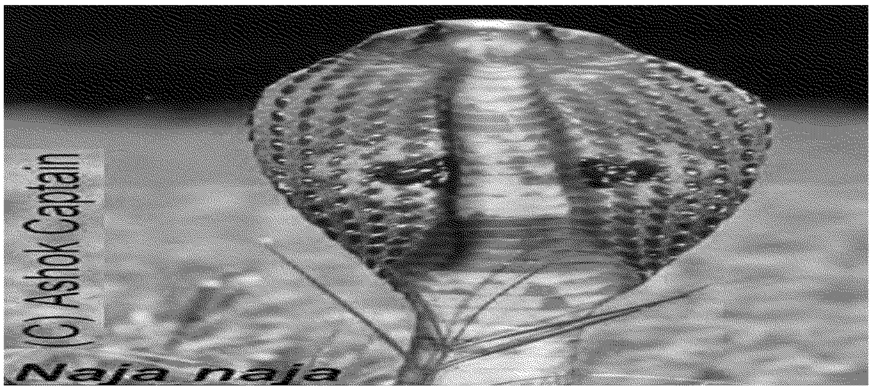


Palestinian Viper - Turkey, Syria, Palestine, Israel, Lebanon, and Jordan

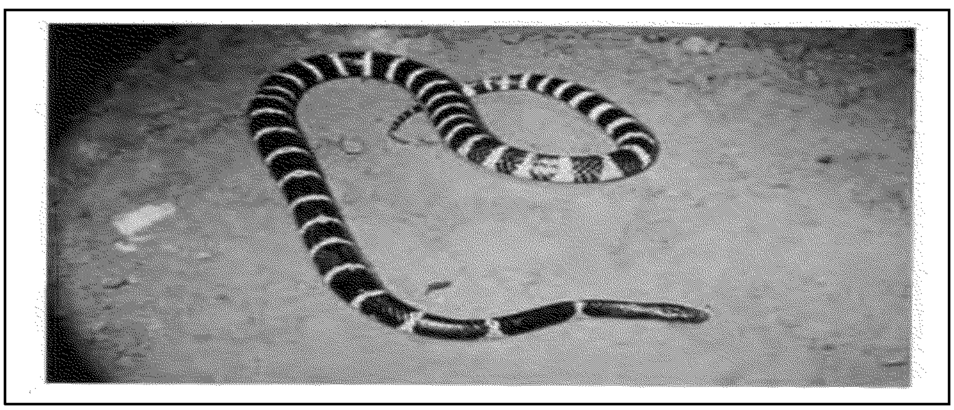


Levant viper or Levant adder, aka: desert or mountain adder, 'kufi' - Greece, Iraq, Syria, Lebanon, Turkey, Afghanistan, lower portion of the former USSR, and Saudi Arabia.

India



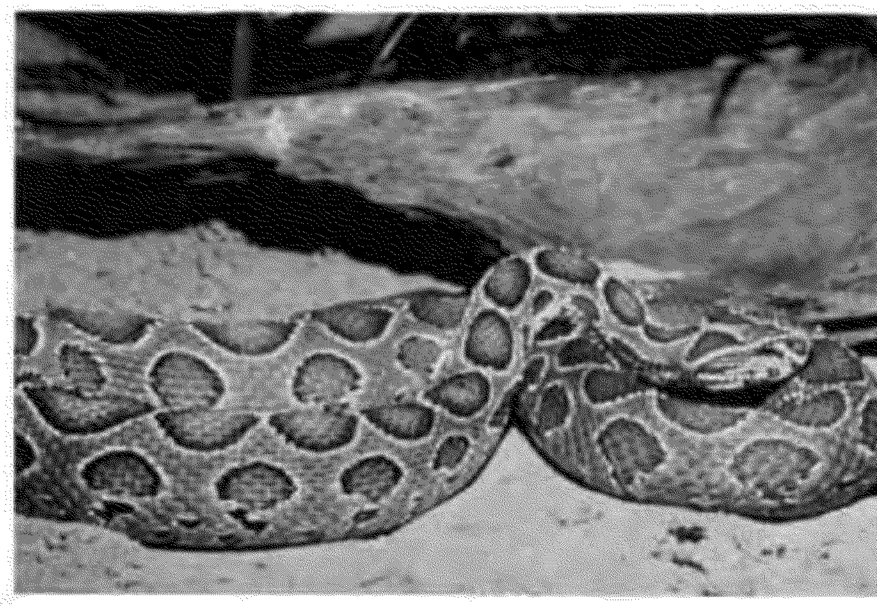
Cobra



Common Krait - India, Sri Lanka, and Pakistan.

Malayan Pit Viper - Thailand, Laos, Cambodia, Java, Sumatra, Malaysia, Vietnam, Burma, and China

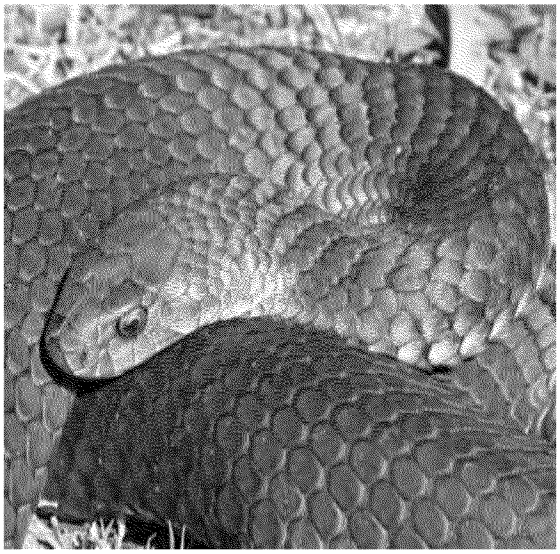
McMahon's Viper- West Pakistan and Afghanistan.

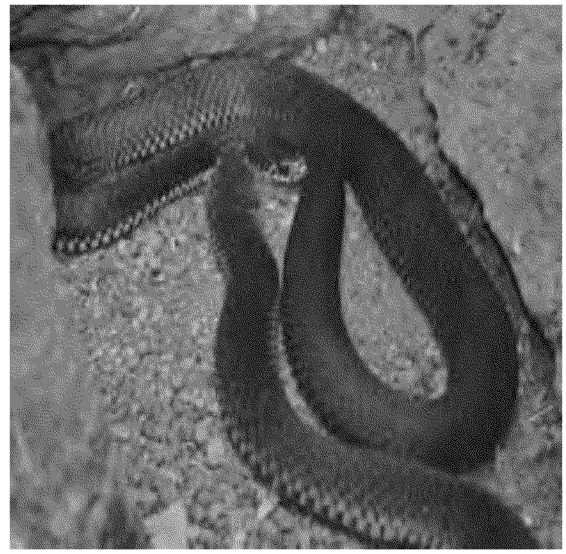


Russell's Viper - Sri Lanka, south China, India, Malaysian Peninsula, Java, Sumatra, Borneo, and surrounding islands.

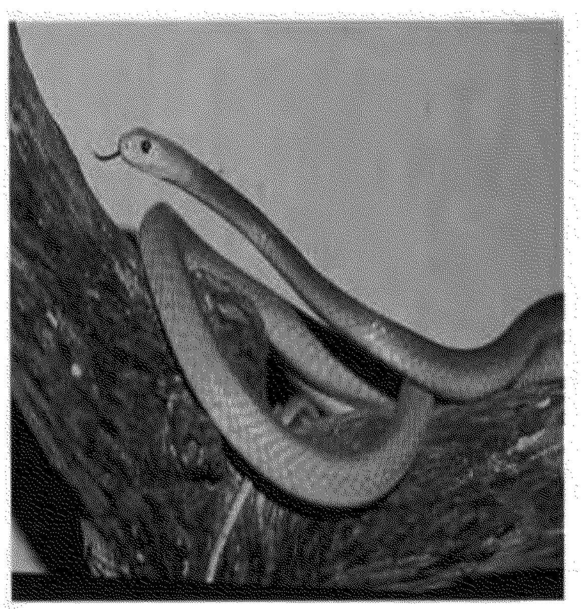
Wagler's pit viper or temple viper - Malaysian Peninsula and Archipelago, Indonesia, Borneo, the Philippines, and Ryuku Islands.

Australasia



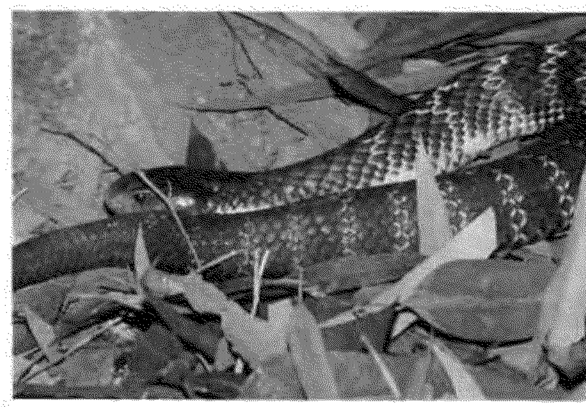


Australian Copperhead - Tasmania, South Australia, Queensland, and Kangaroo Island.



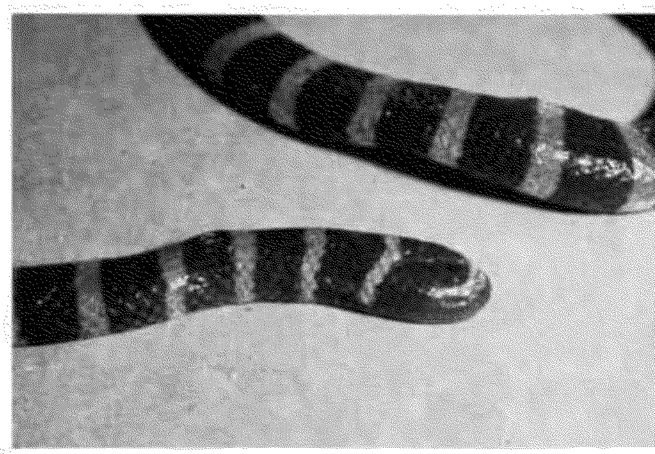
Death Adder Australia, New Guinea, and Moluccas

Taipan - Northern Australia and southern New Guinea

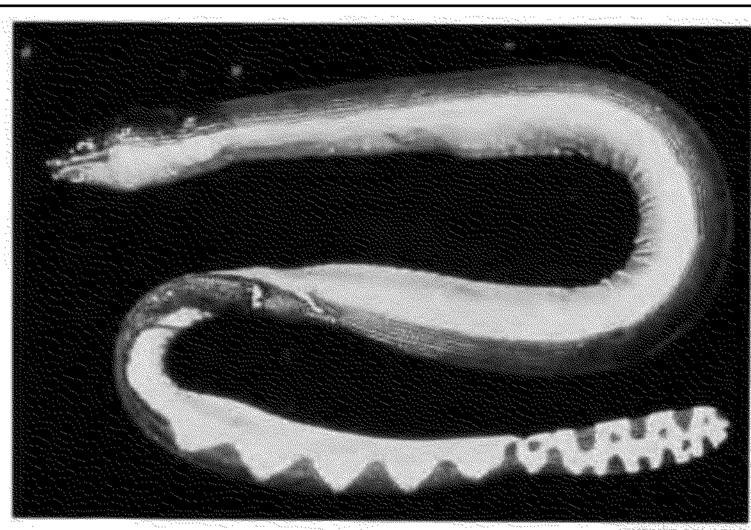


Tiger Snake - Australia, Tasmania, Bass Strait islands, and New Guinea.

Sea Snakes



Banded Sea Snake Coastal waters of New Guinea, Pacific islands, the Philippines, Southeast Asia, Sri Lanka, and Japan.



Yellow Bellied Sea Snake - Throughout the Pacific Ocean from many of the Pacific islands to Hawaii and to the coast of Costa Rica and Panama.

FLD 43 B INSECTS

Sting and Biting Insects

Contact with stinging insects may result in site personnel experiencing adverse health affects that range from being mildly uncomfortable to being life threatening. Therefore, stinging insects present a serious hazard to site personnel and extreme caution must be exercised whenever site and weather conditions increase the risk of encountering stinging insects. These include the following:

- Bees ("Killer" bees, honeybees, bumble bees, wasps, and hornets and wingless wasps)
- Scorpions
- Fire ants
- Spiders

Bees, Wasps, Hornets and Yellow Jackets

The severity of an insect sting reaction varies from person to person. A normal reaction will result in pain, swelling and redness confined to the sting site. Simply disinfect the area (washing with soap and water will do) and apply ice to reduce the swelling.

A large local reaction will result in swelling that extends beyond the sting site. For example, a sting on the forearm could result in the entire arm swelling twice its normal size.

Although alarming in appearance, this condition is often treated the same as a normal reaction. An unusually painful or very large local reaction may need medical attention. Because this condition may persist for two to three days, antihistamines and corticosteroids are sometimes prescribed to lessen the discomfort.

Yellow jackets, hornets and wasps can sting repeatedly. Honeybees have barbed stingers that are left behind in their victim's skin. These stingers are best removed by a scraping action, rather than a pulling motion, which may actually squeeze more venom into the skin.

Personnel should be very cautious of "killer" bees. They have the appearance of the typical honeybee, however, they are very aggressive. These Africanized honeybees (AHB) defend their colonies much more vigorously than typical bees. The colonies are easily disturbed (sometimes just by being nearby). When they do sting, many more bees may participate, so there is a danger of receiving more stings. This can make them life threatening, especially to people allergic to stings, or with limited capacity to escape (the young, old, and handicapped).

Scorpions

Scorpion stings are a major public health problem in many underdeveloped tropical countries. For every person killed by a poisonous snake, 10 are killed by a poisonous scorpion. In Mexico, 1000 deaths from scorpion stings occur per year. In the United States, only 4 deaths in 11 years have occurred as a result of scorpion stings. Furthermore, scorpions can be found outside their normal range of distribution, ie, when they accidentally crawl into luggage, boxes, containers, or shoes and are unwittingly transported home via human travelers.

Out of 1500 scorpion species, 50 are dangerous to humans. Scorpion stings cause a wide range of conditions, from severe local skin reactions to neurologic, respiratory, and cardiovascular collapse.

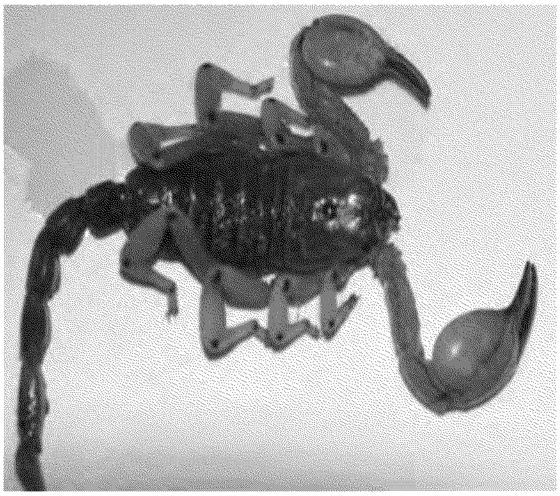
Almost all of these lethal scorpions, except the *Hemiscorpius* species, belong to the scorpion family called the Buthidae. The Buthidae family is characterized by a triangular-shaped sternum, as opposed to the pentagonal-shaped sternum found in the other 5 scorpion families. In addition to the triangular-shaped sternum, poisonous scorpions also tend to have weak-looking pincers, thin bodies, and thick tails, as opposed to the strong heavy pincers, thick bodies, and thin tails seen in nonlethal scorpions. The lethal members of the Buthidae family include the genera of *Buthus, Parabuthus, Mesobuthus, Tityus, Leiurus, Androctonus,* and *Centruroides*. These lethal scorpions are found generally in the given distribution:

Centruroides - Southwest USA, Mexico, Central America	*Tityus* - Central and South America, Caribbean
Buthus - Mediterranean area	*Androctonus* - Northern Africa to Southeast Asia
Leiurus - Northern Africa and Middle East	*Mesobuthus* - Asia
Parabuthus - Western and Southern Africa	

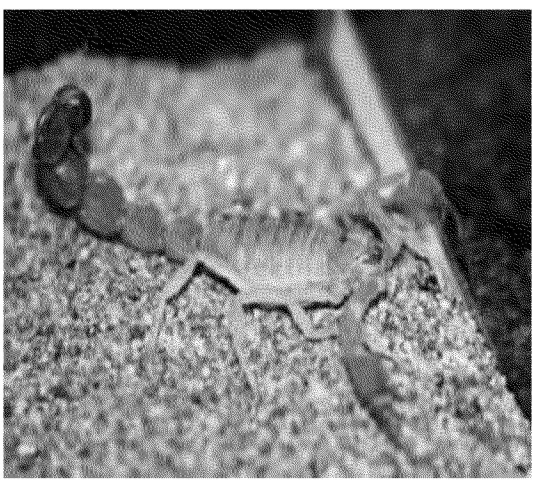
A scorpion has a flattened elongated body and can easily hide in cracks. It has 4 pairs of legs, a pair of claws, and a segmented tail that has a poisonous spike at the end. Scorpions vary in size from 1-20 cm in length.

However, scorpions may be found outside their habitat range of distribution when inadvertently transported with luggage and cargo.

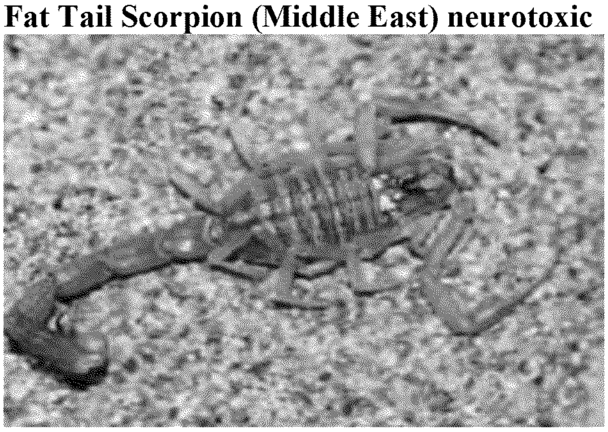
Centruroides (Southwest USA, Mexico)

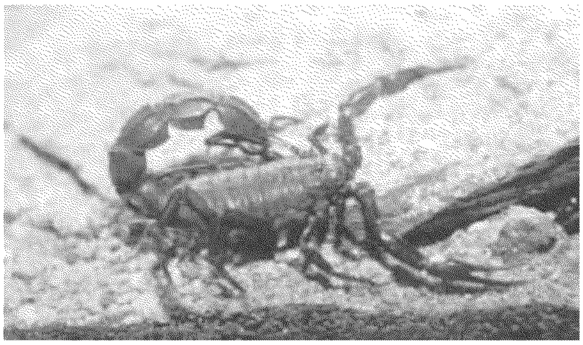
Hemiscorpious (Middle East) cytotoxic

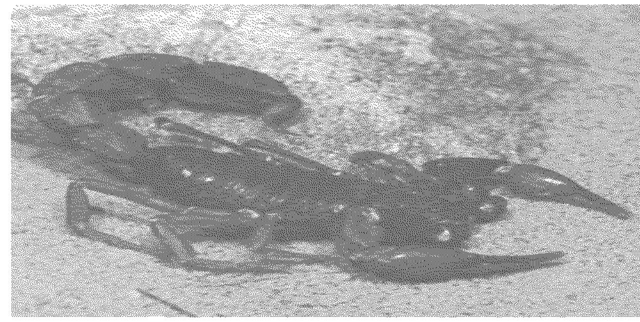
 

Fat Tail Scorpion (Middle East) neurotoxic

Death Stalker ***Leiurus quinquestriatus*** **(Africa Southwest and North) neurotoxic**





Black Scorpion (Middle East) deadly neurotoxin

Prevention

Preventive measures include awareness of scorpions, shaking out clothing and boots before putting them on looking before reaching into likely hiding places and wearing gloves, long sleeved shirts and pants.

Symptoms

In mild cases, the only symptom may be a mild tingling or burning at site of sting.

In severe cases, symptoms may include:

- Eyes and ears - Double vision
- Lungs - Difficulty breathing, No breathing, Rapid breathing,
- Nose, mouth, and throat – Drooling, Spasm of the voice box, Thick-feeling tongue
- Heart and blood - High blood pressure, Increased or decreased heart rate, Irregular heartbeat
- Kidneys and bladder Urinary incontinence, Urine output, decreased
- Muscles and joints - Muscle spasms
- Nervous system – Paralysis, Random movements of head, eye, or neck, Restlessness, Seizures, Stiffness
- Stomach and intestinal tract - Abdominal cramps, Fecal incontinence
- Other -Convulsions

Treatment

1. Recognize scorpion sting symptoms:
2. Wash the area with soap and water.
3. Apply a cool compress on the area of the scorpion sting. Ice (wrapped in a washcloth or other suitable covering) may be applied to the sting location for 10 minutes. Remove compress for 10 minutes and repeat as necessary.
4. Call the Poison Control Center. If you develop symptoms of a poisonous scorpion sting, go to the nearest emergency care facility.
5. Keep your tetanus shots and boosters current.

Fire Ants

Fire ants are aggressive, reddish-brown to black ants that are 1/8 inch to 1/4 inch long. They construct nests, which are often visible as dome-shaped mounds of soil, sometimes as large as 3 feet across and 1 1/2 feet in height. In sandy soils, mounds are flatter and less visible. Fire ants usually build mounds in sunny, open areas such as lawns, pastures, cultivated fields and meadows, but they are not restricted to these areas. Mounds or nests may be located in rotting logs, around trees and stumps, under pavement and buildings, and occasionally indoors.

Fire ants use their stingers to immobilize or kill prey and to defend ant mounds from disturbance by larger animals, such as humans. Any disturbance sends hundreds of workers out to attack anything that moves. The ant grabs its victim with its mandibles (mouthparts) and then inserts its stinger. The process of stinging releases a chemical, which alerts other ants, inducing them to sting. In addition, one ant can sting several times without letting go with its mandibles.

Once stung, humans experience a sharp pain that lasts a couple of minutes, then after a while the sting starts itching and a welt appears. Fire ant venom contains alkaloids and a relatively small amount of protein. The alkaloids kill skin cells; this attracts white blood cells, which form a pustule within a few hours of being stung. The fluid in the pustule is sterile, but if the pustule is broken, the wound may become infected. The protein in the venom can cause allergic reactions that may require medical attention.

Some of the factors related to stinging insects that increase the risk associated with accidental contact are:

- The nests for these insects are frequently found in remote wooded or grassy areas and hidden in cavities
- The nests can be situated in trees, rocks, bushes or in the ground, and are usually difficult to see
- Accidental contact with these insects is highly probable, especially during warm weather conditions when the insects are most active
- If a site worker accidentally disturbs a nest, the worker may be inflicted with multiple stings, causing extreme pain and swelling which can leave the worker incapacitated and in need of medical attention
- Some people are hypersensitive to the toxins injected by a sting, and when stung, experience a violent and immediate allergic reaction resulting in a life-threatening condition known as anaphylactic shock
- Anaphylactic shock manifests itself very rapidly and is characterized by extreme swelling of the body, eyes, face, mouth and respiratory passages
- The hypersensitivity needed to cause anaphylactic shock, can in some people, accumulate over time and exposure, therefore, even if someone has been stung previously, and not experienced an allergic reaction, there is no guarantee that they will not have an allergic reaction if they are stung again

With these things in mind, and with the high probability of contact with stinging insects, use the following safe work practices:

- If a worker knows that he is hypersensitive to bee, wasp or hornet stings, inform the site Safety officer of this condition prior to participation in site activities
- All site personnel will be watchful for the presence of stinging insects and their nests, and will advise the Site Safety officer if a stinging insect nest is located or suspected in the area
- Any nests located on site will be flagged off and site personnel will be notified of its presence
- If attacked, site personnel will immediately seek shelter and stay there. Do not jump in water (bees will still be in the area when you come up). Once safe, remove stings from your skin, it does not matter how you do it, but do it as quickly as possible to reduce the amount of venom they inject. Obtain first aid treatment and contact the safety officer who will observe for signs of allergic reaction

Treatment for fire ant stings is aimed at preventing secondary bacterial infection, which may occur if the pustule is scratched or broken. Clean the blisters with soap and water to prevent secondary infection. Do not break the blister. Topical corticosteroid ointments and oral antihistamines may relieve the itching associated with these reactions.

Site personnel with a known hypersensitivity to stinging insects will keep required emergency medication on or near their person at all times

Spiders

A large variety of spiders may be encountered during site activities. Extreme caution must be used when lifting logs and debris, since spiders are typically found in these areas.

While most spider bites merely cause localized pain, swelling, reddening, and in some cases, tissue damage, there are a few spiders that, due to the severity of the physiological affects caused by their venom, are dangerous. The UXOSO will brief site personnel as to the identification and avoidance of these dangerous spiders. These species include the black widow and the brown or violin spiders.

The black widow is a coal-black bulbous spider 3/4 to 1 1/2 inches in length, with a bright red hourglass on the under side of the abdomen. The black widow is usually found in dark moist locations, especially under rocks, rotting logs and may even be found in outdoor toilets where they inhabit the underside of the seat. Victims of a black widow bite may exhibit the following signs or symptoms:

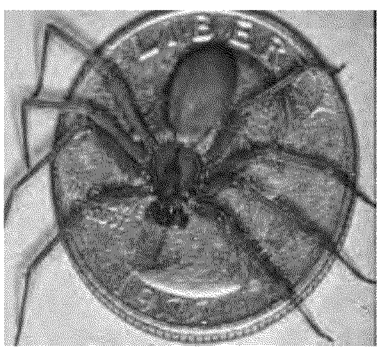
- Sensation of pinprick or minor burning at the time of the bite
- Appearance of small punctures (but sometimes none are visible)
- After 15 to 60 minutes, intense pain is felt at the site of the bite which spreads quickly, and is followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, poor coordination, dilated pupils and generalized swelling of face and extremities

The brown or violin spider is brownish to tan in color, rather flat, and 1/2 to 5/8 inches long. However, unlike the typical species, this spider has been encountered without a violin or “fiddle” shaped mark on the top of the head. Of the brown spider, there are three varieties found in the United States that present a problem to site personnel. These are the brown recluse, the desert violin and the Arizona violin. These spiders may be found in a variety of locations including trees, rocks or in dark locations. Victims of a brown or violin spider bite may exhibit the following signs or symptoms:

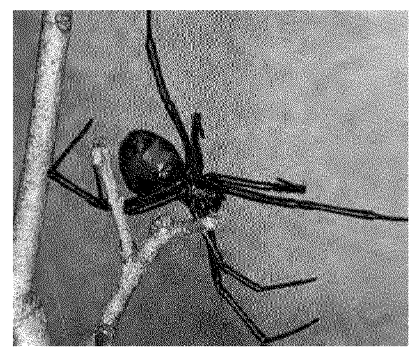
- Blistering at the site of the bite, followed by a local burning at the site 30 to 60 minutes after the bite
- Formation of a large, red, swollen, postulating lesion with a bull's-eye appearance
- Systemic affects may include a generalized rash, joint pain, chills, fever, nausea and vomiting
- Pain may become severe after 8 hours, with the onset of tissue necrosis

There is no effective first aid treatment for either of these bites. Except for very young, very old or weak victims, spider bites are not considered to be life threatening. However, medical treatment must be sought to reduce the extent of damage caused by the injected toxins.

Brown Recluse Spider



Black Widow Spider



First aid should include:

- If possible, catch the spider to confirm its identity. Even if the body is crushed, save it for identification
- Clean the bitten area with soap and water or rubbing alcohol
- To relieve pain, place an ice pack over the bite
- Keep the victim quiet and monitor breathing

Seek immediate medical attention

Sensitivity Reaction to Insect Stings or Bites

A sensitivity reaction is one of the more dangerous and acute effects of insect bites or stings. It is the most common cause of fatalities from bites, particularly from bees, wasps, and spiders. Anaphylactic shock due to stings can lead to severe reactions in the circulatory, respiratory, and central nervous system. This can also result in death.

Site personnel must be questioned regarding their allergic reaction to insect bites. Anyone knowingly allergic should be required to carry and know how to use a response kit. First aid providers must be instructed on how to use the kit also. The kit must be inspected to ensure it is updated.

Administer first aid and observe persons reporting stings for signs of allergic reaction, such as unusual swelling, nausea, dizziness, and shock. At the first sign of these symptoms, take the individual to a medical facility for attention.

Insect Borne Diseases

Diseases that are spread by insects include the following: Rocky Mountain Spotted Fever or Lyme Disease (tick); Bubonic and other forms of Plaque (fleas); Malaria, West Nile Virus and Equine Encephalitis (mosquito) and Leshmaniasis (Sand Flies)

Tick Borne Diseases

Lyme disease is the second most rapidly spreading disease in the U.S.

Lyme Disease

1. Facts

Definition:

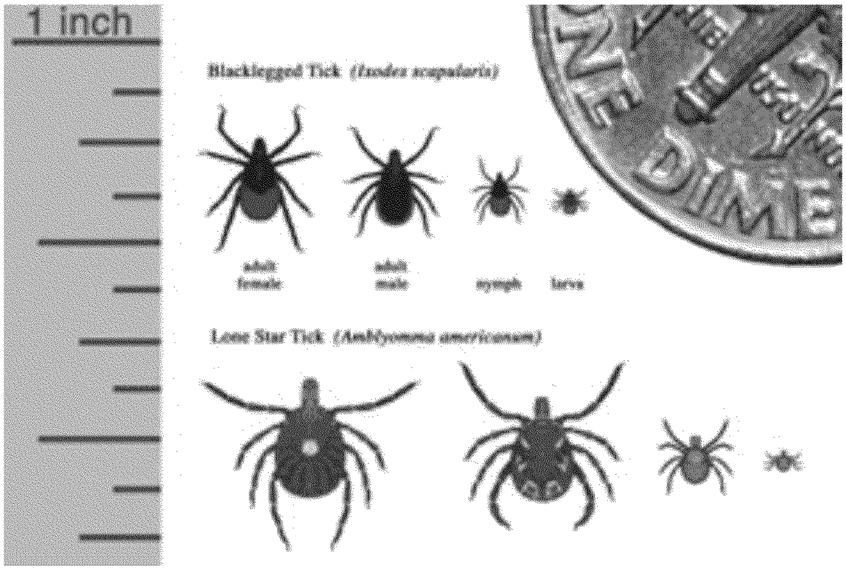
- Bacterial infection transmitted by the bite of an infected black-legged tick more popularly known as the deer tick.

- Prevalence (nationwide and other countries).

- Three stages/sizes of deer ticks:
    - Larvae
    - Nymph
    - Adult

Tick season is May through October.

Not all ticks transmit Lyme disease (Black legged or deer tick [upper] compared to the Lone Star tick [lower])



- Ticks must be attached for several hours before Lyme disease can be transmitted.

- Being bitten by a tick does not mean you will get Lyme disease.

2. Prevention and Protection:

- Wear light-colored, tight-knit clothing.

- Wear long pants and long-sleeved shirts.

- Tuck pant legs into shoes or boots.

- Wear a hat.

- Use insect repellant containing DEET (follow manufacturer's instructions for use on exposed skin).
- Use Permethrin-based repellant applied to clothing (follow manufacturer's instructions for use). This product kills and repels ticks. DO NOT APPLY TO EXPOSED SKIN.
- Check yourself daily for ticks after being in grassy, wooded areas.

- Request information from the Health and Safety Medical Section regarding Lyme disease.

3. If Bitten:

- Remove the tick immediately with fine-tipped tweezers. Grasp the tick as close to the skin as possible. Pull gently but firmly without twisting or crushing the tick.

- Wash your hands and dab the bite with an antiseptic.

- Save the tick in a jar in some alcohol. Label the jar with the date of the bite, the area where you picked up the tick and the spot on your body where you were bitten.
- Monitor the bite for any signs of infection or rash.

4. Symptoms:

Early Signs (may vary from person to person)

- Expanding skin rash.

- Flu-like symptoms during summer or early fall that include the following:
  - Chills, fever, headache, swollen lymph nodes.
  - Stiff neck, aching joints, and muscles.
  - Fatigue.

- Later signs
  - Nervous system problems.
  - Heart problems.
  - Arthritis, especially in knees.

5. Upon Onset of Symptoms:

- Notify your Safety Officer (SO) and your supervisor.

Rocky Mountain Spotted Fever

The Center for Disease Control (CDC) has noted the increase of Rocky Mountain Spotted Fever (RMSF) which is caused by bites from infected ticks that live in and near wooded areas, tall grass and brush.

RMSF has occurred in 36 states, with the heaviest concentrations in Oklahoma, North Carolina, South Carolina, and Virginia. Rocky Mountain spotted fever is the most severe and most frequently reported rickettsial illness in the United States. It also occurs in Mexico and in Central and South America.It is caused by Rocky Mountain Wood Ticks and Dog Ticks that have become infected with rickettsia. Both are black in color.

The disease is caused by *Rickettsia rickettsii*, a species of bacteria that is spread to humans by ixodid (hard) ticks.

Initial signs and symptoms of the disease include sudden onset of fever, headache, and muscle pain, followed by development of rash. The disease can be difficult to diagnose in the early stages, and without prompt and appropriate treatment it can be fatal.

Prevention procedures are the same as for Lyme disease.

Ehrlichiosis

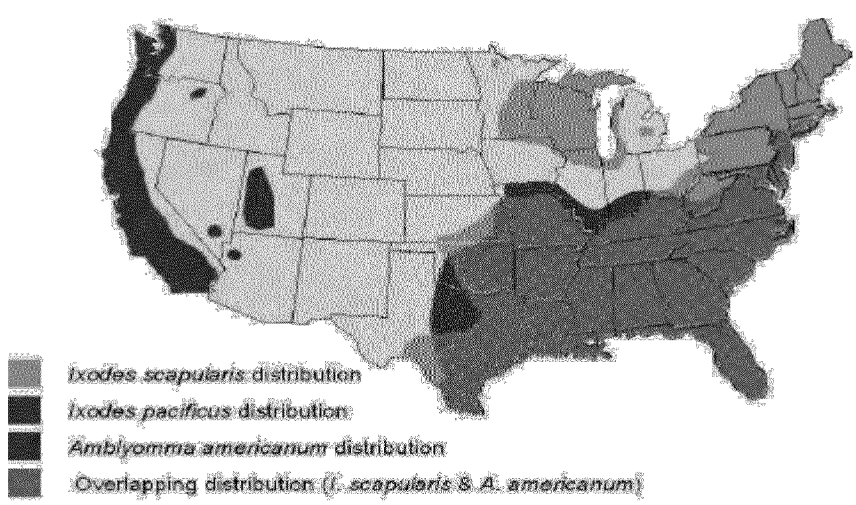
Ehrlichiosis is the general name used to describe several bacterial diseases that affect animals and humans. These diseases are caused by the organisms in the genus *Ehrlichia*. Worldwide, there are currently four ehrlichial species that are known to cause disease in humans.

In the United States, ehrlichiae are transmitted by the bite of an infected tick. The lone star tick (*Amblyomma americanum*), the blacklegged tick (*Ixodes scapularis*), and the western blacklegged tick (*Ixodes pacificus*) are known vectors of ehrlichiosis in the United States. *Ixodes ricinus* is the primary vector in Europe.

The symptoms of ehrlichiosis may resemble symptoms of various other infectious and non-infectious diseases. These clinical features generally include fever, headache, fatigue, and muscle aches. Other signs and symptoms may include nausea, vomiting, diarrhea, cough, joint pains, confusion, and occasionally rash. Symptoms typically appear after an incubation period of 5-10 days following the tick bite. It is possible that many individuals who become infected with ehrlichiae do not become ill or they develop only very mild symptoms.

Most cases of ehrlichiosis are reported within the geographic distribution of the vector ticks (see map below). Occasionally, cases are reported from areas outside the distribution of the tick vector. In most instances, these cases have involved persons who traveled to areas where the diseases are endemic, and who had been bitten by an infected tick and developed symptoms after returning home. Therefore, if you traveled to an ehrlichiosis-endemic area 2 weeks prior to becoming ill, you should tell your doctor where you traveled.

Figure 20. Areas where human ehrlichiosis may occur based on approximate distribution of vector tick species



A diagnosis of ehrlichiosis is based on a combination of clinical signs and symptoms and confirmatory laboratory tests. Blood samples can be sent to a reference laboratory for testing. However, the availability of the different types of laboratory tests varies considerably. Other laboratory findings indicative of ehrlichiosis include low white blood cell count, low platelet count, and elevated liver enzymes.

Ehrlichiosis is treated with a tetracycline antibiotic, usually doxycycline.

Very little is known about immunity to ehrlichial infections. Although it has been proposed that infection with ehrlichiae confers long-term protection against reinfection, there have been occassional reports of laboratory-confirmed reinfection. Short-term protection has been described in animals infected with some *Ehrlichia* species and this protection wanes after about 1 year. Clearly, more studies are needed to determine the extent and duration of protection against reinfection in humans.

Limiting exposure to ticks reduces the likelihood of infection in persons exposed to tick-infested habitats. Prompt careful inspection of your body and removal of crawling or attached ticks is an important method of preventing disease. It may take 24–48 hours of attachment before microorganisms are transmitted from the tick to you.

Preventive measures - Follow protection protocols for Lyme disease

Babesiosis

Babesiosis is an intraerythrocytic parasitic infection caused by protozoa of the genus *Babesia* and transmitted through the bite of the *Ixodes* tick, the same vector responsible for transmission of Lyme disease. While most cases are tick-borne, transfusion and transplacental transmission have been reported. In the United States, babesiosis is usually an asymptomatic infection in healthy individuals. Several groups of patients become symptomatic, and, within these subpopulations, significant morbidity and mortality occur. The disease most severely affects patients who are elderly, immunocompromised, or asplenic. Among those symptomatically infected, the mortality rate is 10% in the United States and 50% in Europe.

The primary vectors of the parasite are ticks of the genus *Ixodes*. In the United States, the black-legged tick, *Ixodes scapularis* (also known as *Ixodes dammini*) is the primary vector for the parasite; in Europe, *Ixodes ricinus* appears to be the primary tick vector. In each location, the *Ixodes* tick vector for *Babesia* is the same vector that locally transmits *Borrelia burgdorferi*, the agent implicated in Lyme disease. The primary US animal reservoir is the white-footed mouse, *Peromyscus leucopus*. Additionally, white-tailed deer serve as transport hosts for the adult tick vector, *I scapularis*. In Europe, the primary animal reservoir is cattle.

The Ixodid ticks ingest *Babesia* during feeding from the host, multiply the protozoa in their gut wall, and concentrate it in their salivary glands. The tick inoculates a new host when feeding again. The parasite then infects red blood cells (RBCs) and differentiated and undifferentiated trophozoites are produced. The former produce 2-4 merozoites that disrupt the RBC and go on to invade other RBCs. This leads to hemolytic anemia, thrombocytopenia, and atypical lymphocyte formation. Alterations in RBC membranes cause decreased conformability and increased red cell adherence, which can lead to development of acute respiratory distress syndrome (ARDS) among those severely affected.

The first US case of babesiosis was reported on Nantucket Island in 1966. An increasing trend over the past 30 years may be the result of restocking of the deer population, curtailment of hunting, and an increase in outdoor recreational activities. Between 1968 and 1993, more than 450 cases of *Babesia* infections were confirmed in the United States. However, the actual prevalence of this disease is unknown because most infected patients are asymptomatic.

The first case of human babesiosis was reported in 1957 from the former Yugoslavia in an asplenic farmer. Approximately 40 cases have been reported since then, mostly in Ireland, the United Kingdom, and France. Sporadic case reports of babesiosis in Japan, Korea, China, Mexico, South Africa, and Egypt have also been documented.

The signs and symptoms mimic malaria and range in severity from asymptomatic to septic shock.

Symptoms include: Generalized weakness, fatigue, depression, fever, anorexia and weight loss, CNS - Headache, photophobia, neck stiffness, altered sensorium, pulmonary - Cough, shortness of breath, GI - Nausea, vomiting, abdominal pain, Musculoskeletal - Arthralgia and myalgia and Renal - Dark urine

Prevention

Prevention measures are the same as for Lyme and other insect borne diseases

Tularemia

Tularemia (also known as "rabbit fever") is a serious infectious disease caused by the bacterium *Francisella tularensis*. The disease is endemic in North America, and parts of Europe and Asia. The primary vectors are ticks and deer flies, but the disease can also be spread through other arthropods. Animals such as rabbits, prairie dogs, hares and muskrats serve as reservoir hosts. The disease is named after Tulare County, California.

Depending on the site of infection, tularemia has six characteristic clinical syndromes: ulceroglandular, glandular, oropharyngeal, pneumonic, oculoglandular, and typhoidal.

The disease has a very rapid onset, with headache, fatigue, dizziness, muscle pains, loss of appetite and nausea. Face and eyes redden and become inflamed. Inflammation spreads to the lymph nodes, which enlarge and may suppurate (mimicking bubonic plague). Lymph node involvement is accompanied by a high fever. Death may result.

Francisella tularensis is one of the most infective bacteria known; fewer than ten organisms can cause disease leading to severe illness. The bacteria penetrate into the body through damaged skin and mucous membranes, or through inhalation. Humans are most often infected by tick bite or through handling an infected animal. Ingesting infected water, soil, or food can also cause infection. Tularemia can also be acquired by inhalation; hunters are at a higher risk for this

disease because of the potential of inhaling the bacteria during the skinning process. Tularemia is not spread directly from person to person.
No vaccine is available to the general public The best way to prevent tularemia infection is to wear rubber gloves when handling or skinning rodents or lagomorphs (as rabbits), avoid ingesting uncooked wild game and untreated water sources, and wearing long-sleeved clothes and using an insect repellant to prevent tick bites.

Prevention

No vaccine is available to the general public The best way to prevent tularemia infection is to wear rubber gloves when handling or skinning rodents or lagomorphs (as rabbits), avoid ingesting uncooked wild game and untreated water sources, and wearing long-sleeved clothes and using an insect repellant to prevent tick bites.

Flea Borne Diseases

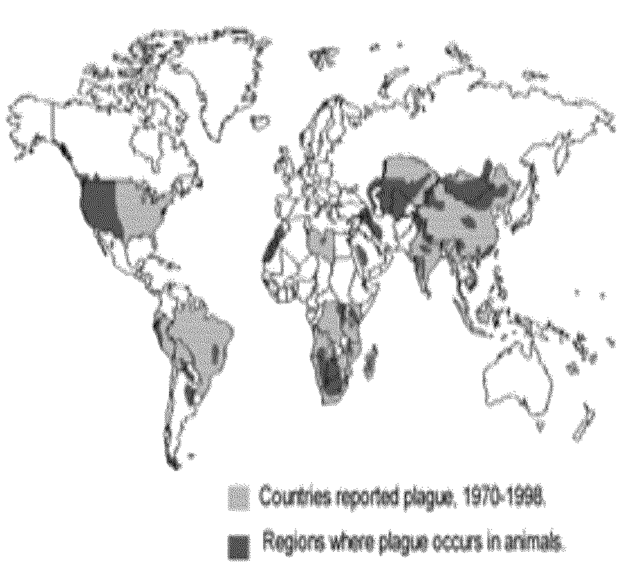
Plague

- **Bubonic plague**: enlarged, tender lymph nodes, fever, chills and prostration
- **Septicemic plague**: fever, chills, prostration, abdominal pain, shock and bleeding into skin and other organs
- **Pneumonic plague**: fever, chills, cough and difficulty breathing; rapid shock and death if not treated early

Introduction: Plague is an infectious disease of animals and humans caused by a bacterium named *Yersinia pestis*.

People usually get plague from being bitten by a rodent flea that is carrying the plague bacterium or by handling an infected animal. Millions of people in Europe died from plague in the Middle Ages, when human homes and places of work were inhabited by flea-infested rats. Today, modern antibiotics are effective against plague, but if an infected person is not treated promptly, the disease is likely to cause illness or death.

World Distribution of Plague, 1998



Risk: Wild rodents in certain areas around the world are infected with plague. Outbreaks in people still occur in rural communities or in cities. They are usually associated with infected rats and rat fleas that live in the home. In the United States, the last urban plague epidemic occurred in Los Angeles in 1924-25. Since then, human plague in the United States has occurred as mostly scattered cases in rural areas (an average of 10 to 15 persons each year). Globally, the

World Health Organization reports 1,000 to 3,000 cases of plague every year. In North America, plague is found in certain animals and their fleas from the Pacific Coast to the Great Plains, and from southwestern Canada to Mexico. Most human cases in the United States occur in two regions: 1) northern New Mexico, northern Arizona, and southern Colorado; and 2) California, southern Oregon, and far western Nevada. Plague also exists in Africa, Asia, and South America (see map).

Diagnosis: The typical sign of the most common form of human plague is a swollen and very tender lymph gland, accompanied by pain. The swollen gland is called a "bubo." Bubonic plague should be suspected when a person develops a swollen gland, fever, chills, headache, and extreme exhaustion, and has a history of possible exposure to infected rodents, rabbits, or fleas.

A person usually becomes ill with bubonic plague 2 to 6 days after being infected.
When bubonic plague is left untreated, plague bacteria invade the bloodstream. As the plague bacteria multiply in the bloodstream, they spread rapidly throughout the body and cause a severe and often fatal condition. Infection of the lungs with the plague bacterium causes the pneumonic form of plague, a severe respiratory illness. The infected person may experience high fever, chills, cough, and breathing difficulty and may expel bloody sputum. If plague patients are not given specific antibiotic therapy, the disease can progress rapidly to death. About 14% (1 in 7) of all plague cases in the United States are fatal.

Prevention and Control

Risk reduction: Attempts to eliminate fleas and wild rodents from the natural environment in plague-infected areas are impractical. However, controlling rodents and their fleas around places where people live, work, and play is very important in preventing human disease. Therefore, preventive measures are directed to home, work, and recreational settings where the risk of acquiring plague is high. A combined approach using the following methods is recommended: environmental sanitation educating the public on ways to prevent plague exposures preventive antibiotic therapy

Environmental Sanitation: Effective environmental sanitation reduces the risk of persons being bitten by infectious fleas of rodents and other animals in places where people live, work, and recreate. It is important to remove food sources used by rodents and make homes, buildings, warehouses, or feed sheds rodent-proof. Applying chemicals that kill fleas and rodents is effective but should usually be done by trained professionals. Rats that inhabit ships and docks should also be controlled by trained professionals who can inspect and, if necessary, fumigate cargoes.

Public Health Education: In the western United States, where plague is widespread in wild rodents, people living, working, or playing where the infection is active face the greatest threat. Educating the general public and the medical community about how to avoid exposure to disease-bearing animals and their fleas is very important and should include the following preventive recommendations:

- Watch for plague activity in rodent populations where plague is known to occur. Report any observations of sick or dead animals to the local health department or law enforcement officials.

- Eliminate sources of food and nesting places for rodents around homes, work places, and recreation areas; remove brush, rock piles, junk, cluttered firewood, and potential-food supplies, such as pet and wild animal food. Make your home rodent-proof.

- If you anticipate being exposed to rodent fleas, apply insect repellents to clothing and skin, according to label instructions, to prevent flea bites. Wear gloves and tyvek coveralls when handling potentially infected animals.

- If you live in areas where rodent plague occurs, treat pet dogs and cats for flea control regularly and not allow these animals to roam freely.

- Health authorities may use appropriate chemicals to kill fleas at selected sites during animal plague outbreaks.

Prophylactic (preventive) antibiotics: Health authorities advise that antibiotics be given for a brief period to people who have been exposed to the bites of potentially infected rodent fleas (for example, during a plague outbreak) or who have handled an animal known to be infected with the plague bacterium. Such experts also recommend that antibiotics be given if a person has had close exposure to a person or an animal (for example, a house cat) with suspected plague pneumonia.

Persons who must be present in an area where a plague outbreak is occurring can protect themselves for 2 to 3 weeks by taking antibiotics. The preferred antibiotics for prophylaxis against plague are the tetracyclines or the sulfonamides.

Other diseases primarily transmitted by Arthropods (Ticks, mites, lice etc.)

Rickettsial Infections

Description

Many species of Rickettsia can cause illnesses in humans (Table below). The term "rickettsiae" conventionally embraces a polyphyletic group of microorganisms in the class Proteobacteria, comprising species belonging to the genera *Rickettsia*, *Orientia, Ehrlichia, Anaplasma, Neo-rickettsia, Coxiella*, and *Bartonella*. These agents are usually not transmissible directly from person to person except by blood transfusion or organ transplantation, although sexual and placental transmission has been proposed for *Coxiella*. Transmission generally occurs via an infected arthropod vector or through exposure to an infected animal reservoir host.

Some of the diseases transmitted in this manner (Typhus, Rocky Mountain Spotted Fever, Q Fever, Ehrlichosis:) are discussed in detail in this and other Biological Hazard FLDs. A summary of these diseases is included in Attachment 1.

Thyphus (Not to be confused with Typhoid Fever [discussed in these FLDs])

For the unrelated disease caused by Salmonella typhi, see Typhoid fever. For the unrelated disease caused by Salmonella paratyphi, please refer to Paratyphoid fever. For the monster of Greek mythology, see Typhus (monster).

Typhus is any one of several similar diseases caused by louse-borne bacteria. The name comes from the Greek *typhos*, meaning smoky or lazy, describing the state of mind of those affected with typhus. *Rickettsia* is endemic in rodent hosts, including mice and rats, and spreads to humans through mites, fleas and body lice. The arthropod vector flourishes under conditions of poor hygiene, such as those found in prisons or refugee camps, amongst the homeless, or until the middle of the 20th century, in armies in the field. In tropical countries, typhus is often mistaken for dengue fever

Epidemic typhus

Epidemic typhus (also called "Jail Fever", "Hospital Fever", "Ship fever", "Famine fever", "Petechial Fever", and "louse-borne typhus") is so named because the disease often causes epidemics following wars and natural disasters. The causative organism is Rickettsia prowazekki, transmitted by the human body louse (*Pediculus humanus corporis*). Feeding on a human who carries the bacillus infects the louse. *R. prowazekii* grows in the louse's gut and is excreted in its feces. The disease is then transmitted to an uninfected human who scratches the louse bite (which itches) and rubs the feces into the wound. The incubation period is one to two weeks. *R. prowazekii* can remain viable and virulent in the dried louse feces for many days. Typhus will eventually kill the louse, though the disease will remain viable for many weeks in the dead louse.

The symptoms set in quickly, and are among the most severe of the typhus family. They include severe headache, a sustained high fever, cough, rash, severe muscle pain, chills, falling blood pressure, stupor, sensitivity to light, and delirium. A rash begins on the chest about five days after the fever appears, and spreads to the trunk and extremities but does not reach the palms and soles. A symptom common to all forms of typhus is a fever which may reach 39°C (102°F).

The infection is treated with antibiotics. Intravenous fluids and oxygen may be needed to stabilize the patient. The mortality rate is 10% to 60%, but is vastly lower if antibiotics such as tetracycline are used early. Infection can also be prevented via vaccination. Brill-Zinsser disease is a mild form of epidemic typhus which recurs in someone after a long period of latency (similar to the relationship between chickenpox and shingles). This type of recurrence can also occur in immunosuppressed patients.

Endemic typhu

Endemic typhus (also called "flea-borne typhus" and "murine typhus" or "rat flea typhus") is caused by the bacteria *Rickettsia typhi*, and is transmitted by the fleas that infest rats. Less often, endemic typhus is caused by *Rickettsia felis* and transmitted by fleas carried by cats or possums.

Symptoms of endemic typhus include headache, fever, chills, myalgia, nausea, vomiting, and cough.

Endemic typhus is highly treatable with antibiotics. Most people recover fully, but death may occur in the elderly, severely disabled or patients with a depressed immune system.

Scrub typhus

Scrub typhus (also called "chigger-borne typhus") is caused byOrientia tsutsugamushi and transmitted by chiggers, which are found in areas of heavy scrub vegetation. Symptoms include fever, headache, muscle pain, cough, and gastrointestinal symptoms. More virulent strains of *O. tsutsugamushi* can cause hemorrhaging and intravascular coagulation.

Prevention

Limiting exposures to vectors or animal reservoirs remains the best means for reducing the risk for disease. Travelers and persons working in areas where organisms may be present should implement prevention based on avoidance of vector-infested habitats, use of repellents and protective clothing, prompt detection and removal of arthropods from clothing and skin, and attention to hygiene.

Typhus fever was categorized by the Center for Disease Control (CDC) as a Category B biological weapons agent. Rickettsia prowazekii is highly infectious and could be fatal but cannot be passed from person to person.

Encephalitis Arboviral Encephalitides

Perspectives

Arthropod-borne viruses, i.e., arboviruses, are viruses that are maintained in nature through biological transmission between susceptible vertebrate hosts by blood feeding arthropods (mosquitoes, psychodids, ceratopogonids, and ticks). Vertebrate infection occurs when the infected arthropod takes a blood meal. The term 'arbovirus' has no taxonomic significance. Arboviruses that cause human encephalitis are members of three virus families: the *Togaviridae* (genus Alphavirus, *Flaviviridae*, and *Bunyaviridae*.

All arboviral encephalitides are zoonotic, being maintained in complex life cycles involving a nonhuman primary vertebrate host and a primary arthropod vector. These cycles usually remain undetected until humans encroach on a natural focus, or the virus escapes this focus via a secondary vector or vertebrate host as the result of some ecologic change. Humans and domestic animals can develop clinical illness but usually are "dead-end" hosts because they do not produce significant viremia, and do not contribute to the transmission cycle. Many arboviruses that cause encephalitis have a variety of different vertebrate hosts and some are transmitted by more than one vector. Maintenance of the viruses in nature may be facilitated by vertical transmission (e.g., the virus is transmitted from the female through the eggs to the offspring).

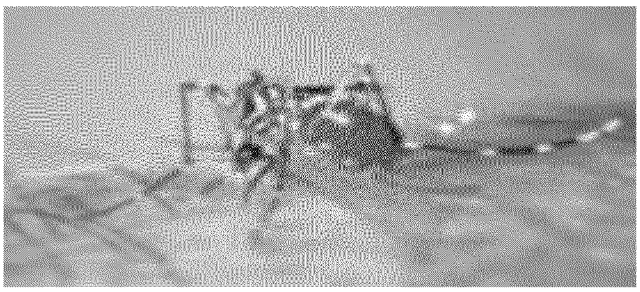
Arboviral encephalitides have a global distribution, but there are four main virus agents of encephalitis in the United States: eastern equine encephalitis (EEE), western equine encephalitis (WEE), St. Louis encephalitis (SLE) and La Crosse (LAC) encephalitis, all of which are transmitted by mosquitoes. Another virus, Powassan, is a minor cause of encephalitis in the northern United States, and is transmitted by ticks. A new Powassan-like virus has recently been isolated from deer ticks. Its relatedness to Powassan virus and its ability to cause disease has not been well documented. Most cases of arboviral encephalitis occur from June through September, when arthropods are most active. In milder (i.e., warmer) parts of the country, where arthropods are active late into the year, cases can occur into the winter months.

There is expanded discussion of several of these diseases (West Nile and Eastern Equien Encephalitis elsewhere in this document. A more general discussion is found in Attachment 2.

Mosquito Borne Diseases

Malaria

Malaria is a mosquito-borne disease caused by a parasite. Four kinds of malaria parasites can infect humans: *Plasmodium falciparum, P. vivax, P. ovale,* and *P. malariae.*



People with malaria often experience fever, chills, and flu-like illness. Left untreated, they may develop severe complications and die. Each year 350-500 million cases of malaria occur worldwide, and over one million people die, most of them young children in sub-Saharan Africa. Infection with any of the malaria species can make a person feel very ill; infection with *P. falciparum*, if not promptly treated, may be fatal. Although malaria can be a fatal disease, illness and death from malaria are largely preventable.

This sometimes fatal disease can be prevented and cured. Bed nets, insecticides, and anti-malarial drugs are effective tools to fight malaria in areas where it is transmitted. Travelers to a malaria-risk area should avoid mosquito bites and take a preventive anti-malarial drug. Malaria was eradicated from the United States in the early 1950s. However, malaria is common in many developing countries and travelers who visit these areas risk getting malaria.

Returning travelers and arriving immigrants could also reintroduce the disease in the United States if they are infected with malaria when they return. The mosquito that transmits malaria, *Anopheles*, is found throughout much of the United States. If local mosquitoes bite an infected person, those mosquitoes can, in turn, infect local residents (*introduced malaria*).

Because the malaria parasite is found in red blood cells, malaria can also be transmitted through blood transfusion, organ transplant, or the shared use of needles or syringes contaminated with blood. Malaria may also be transmitted from a mother to her fetus before or during delivery ("congenital" malaria).

Malaria is not transmitted from person to person like a cold or the flu. You cannot get malaria from casual contact with malaria-infected people.

Prevention and control

You can prevent malaria by:

- keeping mosquitoes from biting you, especially at night
- taking anti-malarial drugs to kill the parasites
- eliminating places where mosquitoes breed
- spraying insecticides on walls to kill adult mosquitoes that come inside
- sleeping under bed nets - especially effective if they have been treated with insecticide,
- wearing insect repellent and long-sleeved clothing if out of doors at night

The surest way for you and your health-care provider to know whether you have malaria is to have a diagnostic test where a drop of your blood is examined under the microscope for the presence of malaria parasites. If you are sick and there is any suspicion of malaria (for example, if you have recently traveled in a malaria-risk area) the test should be performed without delay.

The disease should be treated early in its course, before it becomes severe and poses a risk to the patient's life. Several good anti-malarial drugs are available, and should be administered early on. The most important step is to think about malaria, so that the disease is diagnosed and treated in time.

West Nile Virus

West Nile virus (WNV) is a potentially serious illness. Experts believe WNV is established as a seasonal epidemic in North America that flares up in the summer and continues into the fall. This fact sheet contains important information that can help you recognize and prevent WNV.

The easiest and best way to avoid WNV is to prevent mosquito bites.

- When you are outdoors, use insect repellent containing an EPA-registered active ingredient. Follow the directions on the package.

- Many mosquitoes are most active at dusk and dawn. Be sure to use insect repellent and wear long sleeves and pants at these times or consider staying indoors during these hours.

- Make sure you have good screens on your windows and doors to keep mosquitoes out.

- Get rid of mosquito breeding sites by emptying standing water from buckets, barrels and drainage ditches.

About one in 150 people infected with WNV will develop severe illness. The severe symptoms can include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis. These symptoms may last several weeks, and neurological effects may be permanent.

Up to 20 percent of the people who become infected have symptoms such as fever, headache, and body aches, nausea, vomiting, and sometimes swollen lymph glands or a skin rash on the chest, stomach and back. Symptoms can last for as short as a few days, though even healthy people have become sick for several weeks.

Approximately 80 percent of people (about 4 out of 5) who are infected with WNV will not show any symptoms at all.
Most often, WNV is spread by the bite of an infected mosquito. Mosquitoes become infected when they feed on infected birds. Infected mosquitoes can then spread WNV to humans and other animals when they bite.

In a very small number of cases, WNV also has been spread through blood transfusions, organ transplants, breastfeeding and even during pregnancy from mother to baby.

WNV is not spread through casual contact such as touching or kissing a person with the virus.

Symptoms typically develop between 3 - 14 days after being bitten by an infected mosquito.

There is no specific treatment for WNV infection. In cases with milder symptoms, people experience symptoms such as fever and aches that pass on their own, although even healthy people have become sick for several weeks. In more severe cases, people usually need to go to the hospital where they can receive supportive treatment including intravenous fluids, help with breathing and nursing care.

Milder WNV illness improves on its own, and people do not necessarily need to seek medical attention for this infection though they may choose to do so. If you develop symptoms of severe WNV illness, such as unusually severe headaches or confusion, seek medical attention immediately. Severe WNV illness usually requires hospitalization. Pregnant women and nursing mothers are encouraged to talk to their doctor if they develop symptoms that could be WNV. People over the age of 50 are more likely to develop serious symptoms of WNV if they do get sick and should take special care to avoid mosquito bites.

The more time you're outdoors, the more time you could be bitten by an infected mosquito. Pay attention to avoiding mosquito bites if you spend a lot of time outside, either working or playing.

All donated blood is checked for WNV before being used. The risk of getting WNV through blood transfusions and organ transplants is very small, and should not prevent people who need surgery from having it. If you have concerns, talk to your doctor.

Equine Encephalitis

Eastern equine encephalitis (EEE) is a mosquito-borne viral disease. EEE virus (EEEV) occurs in the eastern half of the United States where it causes disease in humans, horses, and some bird species. Because of the high mortality rate, EEE is regarded as one of the most serious mosquito-borne diseases in the United States.

EEEV is transmitted to humans through the bite of an infected mosquito. It generally takes from

3 to 10 days to develop symptoms of EEE after being bitten by an infected mosquito. The main EEEV transmission cycle is between birds and mosquitoes.

Many species of mosquitoes can become infected with EEEV. The most important mosquito species in maintaining the bird-mosquito transmission cycle is *Culiseta melanura*, which reproduces in freshwater hardwood swamps. *Culiseta melanura*, however, is not considered to be an important vector of EEEV to horses or humans because it feeds almost exclusively on birds.

Transmission to horses or humans requires mosquito species capable of creating a “bridge” between infected birds and uninfected mammals such as some *Aedes*, *Coquillettidia*, and *Culex* species.

Horses are susceptible to EEE and some cases are fatal. EEEV infections in horses, however, are not a significant risk factor for human infection because horses are considered to be “dead-end” hosts for the virus (i.e., the amount of EEEV in their bloodstreams is usually insufficient to infect mosquitoes).

Eastern equine encephalitis virus is a member of the family Togaviridae, genus *Alphaviru* closely related to Western equine encephalitis virus and Venezuelan equine encephalitis virus

Many persons infected with EEEV have no apparent illness. In those persons who do develop illness, symptoms range from mild flu-like illness to inflammation of the brain, coma and death.

The mortality rate from EEE is approximately one-third, making it one of the most deadly mosquito-borne diseases in the United States.

There is no specific treatment for EEE; optimal medical care includes hospitalization and supportive care (for example, expert nursing care, respiratory support, prevention of secondary bacterial infections, and physical therapy, depending on the situation).

Approximately half of those persons who survive EEE will have mild to severe permanent neurologic damage.

Incidence rate includes:

- Approximately 220 confirmed cases in the US 1964-2004, Average of 5 cases/year, with a range from 0-15 cases

- States with largest number of cases are Florida, Georgia, Massachusetts, and New Jersey.

- EEEV transmission is most common in and around freshwater hardwood swamps in the Atlantic and Gulf Coast states and the Great Lakes region.

- Human cases occur relatively infrequently, largely because the primary transmission cycle takes place in and around swampy areas where human populations tend to be limited.

Risk Groups:

- Residents of and visitors to endemic areas (areas with an established presence of the virus)
- People who engage in outdoor work and recreational activities in endemic areas.
- Persons over age 50 and younger than age 15 seem to be at greatest risk for developing severe EEE when infected with the virus.

Prevention

- A vaccine is available to protect equines.
- People should avoid mosquito bites by employing personal and workplace protection measures, such as using an EPA-registered repellent according to manufacturers' instructions, wearing protective clothing, avoiding outdoor activity when mosquitoes are active (some bridge vectors of EEEV are aggressive day-biters), and removing standing water that can provide mosquito breeding sites.
- There are laboratory tests to diagnosis EEEV infection including serology, especially IgM testing of serum and cerebrospinal fluid (CSF), and neutralizing antibody testing of acute- and convalescent-phase serum.

Yellow Fever

Yellow fever is an acute viral disease It is an important cause of hemorrhagic illness in many African and South American countries despite existence of an effective vaccine. The *yellow* refers to the jaundice symptoms that affect some patients.

Yellow fever is caused by an arbovirus of the family Flaviviridae, a positive single-stranded RNA virus. Human infection begins after deposition of viral particles through the skin in infected arthropod saliva. The mosquitos involved are *Aedes simpsaloni*, *A. africanus*, and *A. aegypti* in Africa, the Haemagogus genus in South America.

The virus remains silent in the body during an incubation period of three to six days. There are then two disease phases. While some infections have no symptoms the first, *acute* phase is normally characterized by fever, muscle pain (with prominent backache), headache, shivers, loss of appetite, and nausea or vomiting. The high fever is often paradoxically associated with a slow pulse (known as Faget's sign). After three or four days most patients improve and their symptoms disappear.

Fifteen percent of patients, however, enter a *toxic phase* within 24 hours. Fever reappears and several body systems are affected. The patient rapidly develops jaundice and complains of abdominal pain with vomiting. Bleeding can occur from the mouth, nose, eyes, and stomach. Once this happens, blood appears in the vomit and feces. Kidney function deteriorates; this can range from abnormal protein levels in the urine (proteinuria) to complete kidney failure with no urine production (anuria). Half of the patients in the "toxic phase" die within fourteen days. The remainder recover without significant organ damage.

Yellow fever is difficult to recognize, especially during the early stages. It can easily be confused with malaria, typhoid, rickettsial diseases, haemorrhagic viral fevers (e.g. Lassa), arboviral infections (e.g. dengue), leptospirosis, viral hepatitis and poisoning (e.g. carbon tetrachloride). A laboratory analysis is required to confirm a suspect case.

Prevention

There is a vaccine for yellow fever that gives a ten-year or more immunity from the disease and effectively protects people traveling to affected areas. The vaccination may be required for entry to some countries, however, the vaccine may be contra-indicated for person over 60 years of age.

Use precautions as for other mosquito borne diseases. Avoid mosquito bites by employing personal and workplace protection measures, such as using an EPA-registered repellent according to manufacturers' instructions, wearing protective clothing, avoiding outdoor activity when mosquitoes are active and removing standing water that can provide mosquito breeding sites.

Meningitis

Meningitis is a viral disease that can affect the central nervous system.

Meningitis is encountered in agricultural regions of Asia.

Meningitis is transmitted through the bite from an infected mosquito.

Symptoms can be nonexistent or severe and flu-like, with fever, chills, tiredness, headache, nausea and vomiting. If not treated promptly the disease can be fatal.

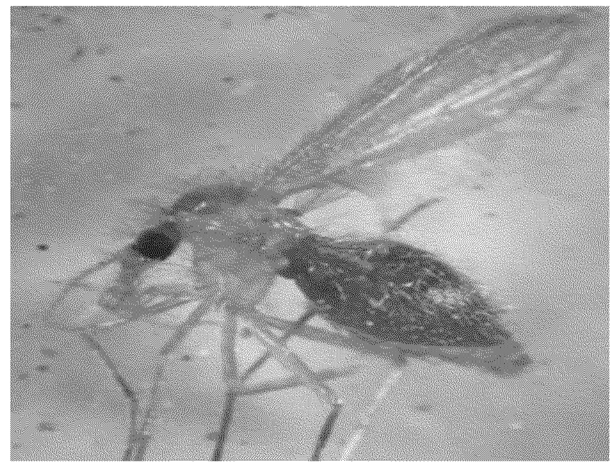
Prevention

- A vaccine is available. It's 80% effective after a single dose and 97.5% effective after a second dose.

  Use precautions as for other mosquito borne diseases. Avoid mosquito bites by employing personal and workplace protection measures, such as using an EPA-registered repellent according to manufacturers' instructions, wearing protective clothing, avoiding outdoor activity when mosquitoes are active and removing standing water that can provide mosquito breeding sites.

Sand Flies

Leishmaniasis



Sand Fly and Mosquito Sand Fly

Leishmaniasis (LEASH-ma-NIGH-a-sis) is a parasitic disease spread by the bite of infected sand flies. There are several different forms of leishmaniasis. The most common forms are **cutaneous leishmaniasis,** which causes skin sores, and **visceral leishmaniasis**, which affects some of the internal organs of the body (for example, spleen, liver, bone marrow).

People who have cutaneous leishmaniasis have one or more sores on their skin. The sores can change in size and appearance over time. They often end up looking somewhat like a volcano, with a raised edge and central crater. Some sores are covered by a scab. The sores can be painless or painful. Some people have swollen glands near the sores (for example, under the arm if the sores are on the arm or hand).

People who have visceral leishmaniasis usually have fever, weight loss, and an enlarged spleen and liver (usually the spleen is bigger than the liver). Some patients have swollen glands. Certain blood tests are abnormal. For example, patients usually have low blood counts, including a low red blood cell count (anemia), low white blood cell count, and low platelet count.

The number of new cases of cutaneous leishmaniasis each year in the world is thought to be about 1.5 million. The number of new cases of visceral leishmaniasis is thought to be about 500,000.

Leishmaniasis is found in parts of about 88 countries. Approximately 350 million people live in these areas. Most of the affected countries are in the tropics and subtropics. The settings in which leishmaniasis is found range from rain forests in Central and South America to deserts in West Asia. More than 90 percent of the world's cases of visceral leishmaniasis are in India, Bangladesh, Nepal, Sudan, and Brazil.

Leishmaniasis is found in some parts of the following areas:

- in Mexico, Central America, and South America -- from northern Argentina to Texas (not in Uruguay, Chile, or Canada)
- southern Europe (leishmaniasis is not common in travelers to southern Europe)
- Asia (not Southeast Asia)
- the Middle East
- Africa (particularly East and North Africa, with some cases elsewhere)

Leishmaniasis is not found in Australia or Oceania (that is, islands in the Pacific, including Melanesia, Micronesia, and Polynesia).

It is possible but very unlikely that you would get leishmaniasis in the United States. Very rarely, people living in Texas have developed skin sores from cutaneous leishmaniasis.

No cases of visceral leishmaniasis are known to have been acquired in the United States.

Leishmaniasis is spread by the bite of some types of phlebotomine sand flies. Sand flies become infected by biting an infected animal (for example, a rodent or dog) or person. Since sand flies do not make noise when they fly, people may not realize they are present. Sand flies are very small and may be hard to see; they are only about one-third the size of typical mosquitoes. Sand flies usually are most active in twilight, evening, and night-time hours (from dusk to dawn). Sand flies are less active during the hottest time of the day. However, they will bite if they are disturbed, such as when a person brushes up against the trunk of a tree where sand flies are resting. Rarely, leishmaniasis is spread from a pregnant woman to her baby. Leishmaniasis also can be spread by blood transfusions or contaminated needles.

People of all ages are at risk for leishmaniasis if they live or travel where leishmaniasis is found. Leishmaniasis usually is more common in rural than urban areas; but it is found in the outskirts of some cities. The risk for leishmaniasis is highest from dusk to dawn because this is when sand flies are the most active. All it takes to get infected is to be bitten by one infected sand fly. This is more likely to happen the more people are bitten, that is, the more time they spend outside in rural areas from dusk to dawn.

People with cutaneous leishmaniasis usually develop skin sores within a few weeks (sometimes as long as months) of when they were bitten.

People with visceral leishmaniasis usually become sick within several months (rarely as long as years) of when they were bitten.

The skin sores of cutaneous leishmaniasis will heal on their own, but this can take months or even years. The sores can leave ugly scars. If not treated, infection that started in the skin rarely spreads to the nose or mouth and causes sores there (**mucosal leishmaniasis**). This can happen with some of the types of the parasite found in Central and South America. Mucosal leishmaniasis might not be noticed until years after the original skin sores healed. The best way to prevent mucosal leishmaniasis is to treat the cutaneous infection before it spreads.

If not treated, visceral leishmaniasis can cause death. It is very rare for travelers to get visceral leishmaniasis.

If you think you might have leishmaniasis, report to your Safety Officer to ensure appropriate follow-up. The first step is to find out if you have traveled to a part of the world where leishmaniasis is found. The health care provider will ask you about any signs or symptoms of leishmaniasis you may have, such as skin sores that have not healed. If you have skin sores, the health care provider will likely want to take some samples directly from the sores. These samples can be examined for the parasite under a microscope, in cultures, and through other means. A blood test for detecting antibody (immune response) to the parasite can be helpful, particularly for cases of visceral leishmaniasis. However, tests to look for the parasite itself should also be done. Diagnosing leishmaniasis can be difficult. Sometimes the laboratory tests are negative even if a person has leishmaniasis.

The health care provider can talk with CDC staff about whether a case of leishmaniasis should be treated, and, if so, how. Most people who have cutaneous leishmaniasis do not need to be hospitalized during their treatment.

Prevention

The best way prevent leishmaniasis is by protecting against sand fly bites. Vaccines and drugs for preventing infection are not yet available. To decrease risk of being bitten:

- Stay in well-screened or air-conditioned areas as much as possible. Avoid outdoor activities, especially from dusk to dawn, when sand flies are the most active.

- When outside, wear long-sleeved shirts, long pants, and socks. Tuck your shirt into your pants.

- Apply insect repellent on uncovered skin and under the ends of sleeves and pant legs. Follow the instructions on the label of the repellent. The most effective repellents are those that contain the chemical DEET (N,N-diethylmetatoluamide). The concentration of DEET varies among repellents. Repellents with DEET concentrations of 30-35% are quite effective, and the effect should last about 4 hours. Lower concentrations should be used for children (no more than 10% DEET). Repellents with DEET should be used sparingly on children from 2 to 6 years old and not at all on children less than 2 years old.

- Spray clothing with permethrin-containing insecticides. The insecticide should be reapplied after every five washings.

- Spray living and sleeping areas with an insecticide to kill insects.

- If you are not sleeping in an area that is well screened or air-conditioned, use a bed net and tuck it under your mattress. If possible, use a bed net that has been soaked in or sprayed with permethrin. The permethrin will be effective for several months if the bed net is not washed. Keep in mind that sand flies are much smaller than mosquitoes and therefore can get through smaller holes. Fine-mesh netting (at least 18 holes to the inch; some sources say even finer) is needed for an effective barrier against sand flies. This is particularly important if the bed net has not been treated with permethrin. However, it may be uncomfortable to sleep under such a closely woven bed net when it is hot.

NOTE: Bed nets, repellents containing DEET, and permethrin may need to be purchased before traveling and can be found in hardware, camping, and military surplus stores.

Deer Flies (See Tularemia above)

ATTACHMENT 1

RICKETTSIAL INFECTIONS

Rickettsial Infections

Description

Many species of Rickettsia can cause illnesses in humans (Table below). The term "rickettsiae" conventionally embraces a polyphyletic group of microorganisms in the class Proteobacteria, comprising species belonging to the genera *Rickettsia*, *Orientia, Ehrlichia, Anaplasma, Neo-rickettsia, Coxiella*, and *Bartonella*. These agents are usually not transmissible directly from person to person except by blood transfusion or organ transplantation, although sexual and placental transmission has been proposed for *Coxiella*. Transmission generally occurs via an infected arthropod vector or through exposure to an infected animal reservoir host. However, sennetsu fever is acquired following consumption of raw fish products. The clinical severity and duration of illnesses associated with different rickettsial infections vary considerably, even within a given antigenic group. Rickettsioses range in severity from diseases that are usually relatively mild (rickettsialpox, cat scratch disease, and African tick-bite fever) to those that can be life-threatening (epidemic and murine typhus, Rocky Mountain spotted fever, scrub typhus and Oroya fever), and they vary in duration from those that can be self-limiting to chronic (Q fever and bartonelloses) or recrudescent (Brill-Zinsser disease). Most patients with rickettsial infections recover with timely use of appropriate antibiotic therapy.

Travelers may be at risk for exposure to agents of rickettsial diseases if they engage in occupational or recreational activities which bring them into contact with habitats that support the vectors or animal reservoir species associated with these pathogens.

The geographic distribution and the risks for exposure to rickettsial agents are described below and in the Table below.

Epidemic Typhus and Trench Fever

Epidemic typhus and trench fever, which are caused by *Rickettsia prowazkeii* and *Bartonella quintanta*, respectively, are transmitted from one person to another by the human body louse. Contemporary outbreaks of both diseases are rare in most developed countries and generally occur only in communities and populations in which body louse infestations are frequent, especially during the colder months when louse-infested clothing is not laundered. Foci of trench fever have also been recognized among homeless populations in urban centers of industrialized countries. Travelers who are not at risk of exposure to body lice or to persons with lice are unlikely to acquire these illnesses. However, health-care workers who care for these patients may be at risk for acquiring louse-borne illnesses through inhalation or inoculation of infectious louse feces into the skin or conjunctiva. In the eastern United States, campers, inhabitants of wooded areas, and wildlife workers can acquire sylvatic epidemic typhus if they come in close contact with flying squirrels, their ectoparasites, or their nests, which can be made in houses, cabins, and tree-holes.

Murine Typhus and Cat-Flea Rickettsiosis

Murine typhus, which is caused by infection with *Rickettsia typhi*, is transmitted to humans by rat fleas, particularly during exposure in rat-infested buildings (3). Flea-infested rats can be found throughout the year in humid tropical environments, especially in harbor or riverine environments. In temperate regions, they are most common during the warm summer months. Similarly, cat-flea rickettsiosis, which is caused by infection with *Rickettsia felis*, occurs worldwide from exposure to flea-infested domestic cats and dogs, as well as peridomestic animals, and is responsible for a murine typhus-like febrile disease in humans.

Scrub Typhus

Mites ("chiggers") transmit *Orientia tsutsugamushi*, the agent of scrub typhus, to humans. These mites occur year-round in a large area from South Asia to Australia and in much of East Asia, including Japan, China, Korea, Maritime Provinces and Sakhalin Island of Russia, and Tajikistan. Their prevalence, however, fluctuates with temperature and rainfall. Infection may occur on coral atolls in both the Indian and Pacific Oceans, in rice paddies and along canals and fields, on oil palm plantations, in tropical to desert climates and in elevated river valleys. Humans typically encounter the arthropod vector of scrub typhus in recently disturbed habitat (e.g., forest clearings) or other persisting mite foci infested with rats and other rodents.

Tick-Borne Rickettsioses

Tick-borne rickettsial diseases are most common in temperate and subtropical regions. These diseases include numerous well-known classical spotted fever rickettsioses and an expanding group of newly recognized diseases (Table belwo). In general, peak transmission of tick-borne rickettsial pathogens occurs during spring and summer months. Travelers who participate in outdoor activities in grassy or wooded areas (e.g., trekking, camping, or going on safari) may be at risk for acquiring tick-borne illnesses, including those caused by *Rickettsia, Anaplasma*, and *Ehrlichia* species (see below).

TABLE Epidemiologic features and symptoms of rickettsial diseases

ANTIGENIC GROUP	DISEASE	AGENT	PREDOMINANT SYMPTOMS*	VECTOR OR ACQUISITION MECHANISM	ANIMAL RESERVOIR	GEOGRAPHIC DISTRIBUTION OUTSIDE THE US
Typhus fevers	Epidemic typhus, Sylvatic typhus	*Rickettsia prowazekii*	Headache, chills, fever, prostration, confusion, photophobia, vomiting, rash (generally starting on trunk)	Human body louse, squirrel flea and louse	Humans, flying squirrels (US)	Cool mountainous regions of Africa, Asia, and Central and South America
	Murine typhus	*R. typhi*	As above, generally less severe	Rat flea	Rats, mice	Worldwide
Spotted fevers	African tickbite fever	*R. africae*	Fever, eschar(s), regional adenopathy,	Tick	Rodents	Sub-Saharan Africa

ANTIGENIC GROUP	DISEASE	AGENT	PREDOMINANT SYMPTOMS*	VECTOR OR ACQUISITION MECHANISM	ANIMAL RESERVOIR	GEOGRAPHIC DISTRIBUTION OUTSIDE THE US
			maculopapular or vesicular rash subtle or absent			
	Aneruptive fever	*R. helvetica*	Fever, headache, myalgia	Tick	Rodents	Old World
	Australian spotted fever	*R. marmionii*	Fever, eschar, maculopapular or vesicular rash, adenopathy	Tick	Rodents, reptiles	Australia
	Cat flea rickettsiosis	*R. felis*	As murine typhus, generally less severe	Cat and dog fleas	Domestic cats, opossums	Europe, South America
	Far Eastern spotted fever	*R. heilongjiangensis*	Fever, eschar, macular or maculopapular rash, lymphadenopathy, enlarged lymph nodes	Tick	Rodents	Far East of Russia, Northern China
	Flinders Island spotted fever, Thai tick typhus	*R. honei*	Mild spotted fever, eschar and adenopathy are rare	Tick	Not defined	Australia, Thailand
	Lymphangitis associated rickettsiosis	*R. sibirica* subsp. *mongolotimonae*	Fever, multiple eschars, regional adenopathy and lymphangitis, maculopapular rash	Tick	Rodents	Southern France, Portugal, Asia, Africa
	Maculatum infection	*R. parkeri*	Fever, eschar, rash maculopapular to vesicular	Tick	Rodents	Brazil, Uruguay
	Mediterranean spotted fevers‡	*R. conorii*	Fever, eschar, regional adenopathy, maculopapular rash on extremities	Tick	Dogs, rodents	Africa, India, Europe, Middle East, Mediterranean
	North Asian tick typhus	*R. sibirica*	Fever, eschar(s), regional adenopathy, maculopapular rash	Tick	Rodents	Russia, China, Mongolia
	Oriental spotted fever	*R. japonica*	As above	Tick	Rodents	Japan
	Queensland tick	*R. australis*	Fever, eschar,	Tick	Not defined	Australia,

ANTIGENIC GROUP	DISEASE	AGENT	PREDOMINANT SYMPTOMS*	VECTOR OR ACQUISITION MECHANISM	ANIMAL RESERVOIR	GEOGRAPHIC DISTRIBUTION OUTSIDE THE US
	typhus		regional adenopathy, rash on extremities			Tasmania
	Rickettsialpox	*R. akari*	Fever, eschar, adenopathy, disseminated vesicular rash	Mite	House mice	Russia, South Africa, Korea, Turkey, Balkan countries
	Rocky Mountain spotted fever, Sao Paulo exanthematic typhus, Minas Gerais exanthematic typhus, Brazilian spotted fever	*R. rickettsii*	Headache, fever, abdominal pain, macular rash progressing into papular or petechial (generally starting on extremities)	Tick	Rodents	Mexico, Central, and South America
	Tick-borne lymphadenopathy (TIBOLA), Dermacentor-borne necrosis and lymphadenopathy (DEBONEL)	*R. slovaca*	Necrosis erythema, cervical lymphadenopathy and enlarged lymph nodes, rare maculopapular rash	Tick	Lagomorphs, rodents	Europe, Asia
	Unnamed rickettsiosis	*R. aeschlimannii*	Fever, eschar, maculopapular rash	Tick	Domestic and wild animals	Africa
Orientia	Scrub typhus	*Orientia tsutsugamushi*	Fever, headache, sweating, conjunctival injection, adenopathy, eschar, rash (starting on trunk), respiratory distress	Mite	Rodents	South, Central, Eastern, and Southeast Asia and Australia
Coxiella	Q fever	*Coxiella burnetii*	Fever, headache, chills, sweating, pneumonia, hepatitis, endocarditis	Most human infections are acquired by inhalation of infectious aerosols; tick	Goats, sheep, cattle, domestic cats, other	Worldwide

ANTIGENIC GROUP	DISEASE	AGENT	PREDOMINANT SYMPTOMS*	VECTOR OR ACQUISITION MECHANISM	ANIMAL RESERVOIR	GEOGRAPHIC DISTRIBUTION OUTSIDE THE US
Bartonella	Cat-scratch disease	*Bartonella henselae*	Fever, adenopathy, neuroretinitis, encephalitis	Cat flea	Domestic cats	Worldwide
	Trench fever	*B. quintana*	Fever, headache, pain in shins, splenomegaly, disseminated rash	Human body louse	Humans	Worldwide
	Oroya fever	*B. bacilliformis*	Fever, headache, anemia, shifting joint and muscle pain, nodular dermal eruption	Sand fly	Unknown	Peru, Ecuador, Colombia
Ehrlichia	Ehrlichiosis	*Ehrlichia chaffeensis*#	Fever, headache, nausea, occasionally rash	Tick	Various large and small mammals, including deer and rodents	Worldwide
Anaplasma	Anaplasmosis	*Anaplasma phagocytophilum*#	Fever, headache, nausea, occasionally rash	Tick	Small mammals, and rodents	Europe, Asia, Africa
Neorickettsia	Sennetsu fever	*Neorickettsia sennetsu*	Fever, chills, headache, sore throat, insomnia	Fish, fluke	Fish	Japan, Malaysia

This represents only a partial list of symptoms. Patients may have different symptoms or only a few of those listed.

‡ Includes 4 different subspecies that can be distinguished serologically and by PCR assay, and respectively are the etiologic agents of Boutonneuse fever and Mediterranean tick fever in Southern Europe and Africa (*R. conorii* subsp. *conorii*), Indian tick typhus in South Asia (*R. conorii* subsp. *indica*), Israeli tick typhus in Southern Europe and Middle East (*R. conorii* subsp. *israelensis*), and Astrakhan spotted fever in the North Caspian region of Russia (*R. conorii* subsp. *caspiae*).
# Organisms antigenically related to these species are associated with ehrlichial diseases outside the continental United States.

Rickettsialpox

Rickettsialpox is generally an urban, mite-vectored disease associated with *R. akari*-infected house mice, although feral rodent-mite reservoirs also have been described (3). Outbreaks of this illness have occurred shortly after rodent extermination programs or natural viral infections that depleted rodent populations and caused the mites to seek new hosts. *R. akari*-infected rodents have been found in urban centers in the former Soviet Union, South Africa, Korea, Croatia, and the United States. Travelers may be at risk for exposure to rodent mites when staying in old urban hostels and cabins.

Anaplasmosis aznd Ehrlichiosis

Human ehrlichiosis and anaplasmosis are acute tick-borne diseases, associated with the lone star tick, *Amblyomma americanum*, and *Ixodes* ticks, respectively. Because one tick may be infected with more than one tick-borne pathogen (e.g. *Borrelia burgdorferi*, the causative agent of Lyme disease, or various *Babesia* species, agent of human babesiosis), patients may present with atypical clinical symptoms that complicate treatment. Ehrlichioses and anaplasmosis are characterized by infection of different types of leukocytes, where the causative agent multiplies in cytoplasmic membrane-bound vacuole called morulae. Morulae can sometimes be detected in Giemsa-stained blood smears.

Q FEVER

Q fever occurs worldwide, most often in persons who have contact with infected goat, sheep, cat and cattle, particularly parturient animals (especially farmers, veterinarians, butchers, meat packers, and seasonal workers). Travelers who visit farms or rural communities can be exposed to *Coxiella burnetii*, the agent of Q fever, through airborne transmission (via animal-contaminated soil and dust) or less commonly through consumption of unpasteurized milk products or by exposure to infected ticks. These infections may initially result in only mild and self-limiting influenza-like illnesses, but if untreated, infections may become chronic, particularly in persons with preexisting heart valve abnormalities or with prosthetic valves. Such persons can develop chronic and potentially fatal endocarditis.

Cat-Scratch Disease and Oroya Fever

Cat-scratch disease is contracted through scratches and bites from domestic cats, particularly kittens, infected with *Bartonella henselae*, and possibly from their fleas (3,4). Exposure can therefore occur wherever cats are found. Oroya fever is transmitted by sandflies infected with *B. bacilliformis*, which is endemic in the Andean highlands.

Symptoms

Clinical presentations of rickettsial illnesses vary (Table above), but common early symptoms, including fever, headache, and malaise, are generally nonspecific. Illnesses resulting from infection with rickettsial agents may go unrecognized or are attributed to other causes. Atypical presentations are common and may be expected with poorly characterized non-indigenous agents, so appropriate samples for examination by specialized reference laboratories should be obtained. A diagnosis of rickettsial diseases is based on two or more of the following: 1) clinical symptoms and an epidemiologic history compatible with a rickettsial disease, 2) the development of specific convalescent-phase antibodies reactive with a given pathogen or antigenic group, 3) a positive polymerase chain reaction test result, 4) specific immunohistologic detection of rickettsial agent, or 5) isolation of a rickettsial agent. Ascertaining the likely place and the nature of potential exposures is particularly helpful for accurate diagnostic testing.

Prevention

With the exception of the louse-borne diseases described above, for which contact with infectious arthropod feces is the primary mode of transmission (through autoinoculation into a wound, conjunctiva, or inhalation), travelers and health-care providers are generally not at risk for becoming infected via exposure to an ill person. Limiting exposures to vectors or animal reservoirs remains the best means for reducing the risk for disease. Travelers and persons working in areas where organisms may be present should implement prevention based on avoidance of vector-infested habitats, use of repellents and protective clothing, prompt detection and removal of arthropods from clothing and skin, and attention to hygiene.

Q fever and *Bartonella* group diseases may pose a special risk for persons with abnormal or prosthetic heart valves, and *Rickettsia, Ehrlichia*, and *Bartonella* for persons who are immuno-compromised.

ATTACHMENT 2

ENCEPHALITIS ARBOVIRAL ENCEPHALITIDES

Encephalitis Arboviral Encephalitides

Perspectives

Arthropod-borne viruses, i.e., arboviruses, are viruses that are maintained in nature through biological transmission between susceptible vertebrate hosts by blood feeding arthropods (mosquitoes, psychodids, ceratopogonids, and ticks). Vertebrate infection occurs when the infected arthropod takes a blood meal. The term 'arbovirus' has no taxonomic significance. Arboviruses that cause human encephalitis are members of three virus families: the *Togaviridae* (genus Alphavirus, *Flaviviridae*, and *Bunyaviridae*.

All arboviral encephalitides are zoonotic, being maintained in complex life cycles involving a nonhuman primary vertebrate host and a primary arthropod vector. These cycles usually remain undetected until humans encroach on a natural focus, or the virus escapes this focus via a secondary vector or vertebrate host as the result of some ecologic change. Humans and domestic animals can develop clinical illness but usually are "dead-end" hosts because they do not produce significant viremia, and do not contribute to the transmission cycle. Many arboviruses that cause encephalitis have a variety of different vertebrate hosts and some are transmitted by more than one vector. Maintenance of the viruses in nature may be facilitated by vertical transmission (e.g., the virus is transmitted from the female through the eggs to the offspring).

Arboviral encephalitides have a global distribution, but there are four main virus agents of encephalitis in the United States: eastern equine encephalitis (EEE), western equine encephalitis (WEE), St. Louis encephalitis (SLE) and La Crosse (LAC) encephalitis, all of which are transmitted by mosquitoes. Another virus, Powassan, is a minor cause of encephalitis in the northern United States, and is transmitted by ticks. A new Powassan-like virus has recently been isolated from deer ticks. Its relatedness to Powassan virus and its ability to cause disease has not been well documented. Most cases of arboviral encephalitis occur from June through September, when arthropods are most active. In milder (i.e., warmer) parts of the country, where arthropods are active late into the year, cases can occur into the winter months.

The majority of human infections are asymptomatic or may result in a nonspecific flu-like syndrome. Onset may be insidious or sudden with fever, headache, myalgias, malaise and occasionally prostration. Infection may, however, lead to encephalitis, with a fatal outcome or permanent neurologic sequelae. Fortunately, only a small proportion of infected persons progress to frank encephalitis.

Experimental studies have shown that invasion of the central nervous system (CNS), generally follows initial virus replication in various peripheral sites and a period of viremia. Viral transfer from the blood to the CNS through the olfactory tract has been suggested. Because the arboviral encephalitides are viral diseases, antibiotics are not effective for treatment and no effective antiviral drugs have yet been discovered.

Prevention

Arboviral encephalitis can be prevented in two major ways: personal protective measures and public health measures to reduce the population of infected mosquitoes. Personal measures include reducing time outdoors particularly in early evening hours, wearing long pants and long sleeved shirts and applying mosquito repellent to exposed skin areas. Public health measures often require spraying of insecticides to kill juvenile (larvae) and adult mosquitoes.

Selection of mosquito control methods depends on what needs to be achieved; but, in most emergency situations, the preferred method to achieve maximum results over a wide area is aerial spraying. In many states aerial spraying may be available in certain locations as a means to control nuisance mosquitoes. Such resources can be redirected to areas of virus activity. When aerial spraying is not routinely used, such services are usually contracted for a given time period. Financing of aerial spraying costs during large outbreaks is usually provided by state emergency contingency funds. Federal funding of emergency spraying is rare and almost always requires a federal disaster declaration. Such disaster declarations usually occur when the vector-borne disease has the potential to infect large numbers of people, when a large population is at risk and when the area requiring treatment is extensive. Special large planes maintained by the United States Air Force can be called upon to deliver the insecticide(s) chosen for such emergencies. Federal disaster declarations have relied heavily on risk assessment by the CDC.

There are no commercially available human vaccines for these U.S. diseases. There is a Japanese encephalitis vaccine available in the U.S. A tick-borne encephalitis vaccine is available in Europe. An equine vaccine is available for EEE, WEE and Venezuelan equine encephalitis (VEE).

La Crosse Encephalitis

La Crosse (LAC) encephalitis was discovered in La Crosse, Wisconsin in 1963. Since then, the virus has been identified in several Midwestern and Mid-Atlantic states. During an average year, about 75 cases of LAC encephalitis are reported to the CDC. Most cases of LAC encephalitis occur in children under 16 years of age. LAC virus is a Bunyavirus and is a zoonotic pathogen cycled between the daytime-biting treehole mosquito, *Aedes triseriatus*, and vertebrate amplifier hosts (chipmunks, tree squirrels) in deciduous forest habitats. The virus is maintained over the winter by transovarial transmission in mosquito eggs. If the female mosquito is infected, she may lay eggs that carry the virus, and the adults coming from those eggs may be able to transmit the virus to chipmunks and to humans.

Historically, most cases of LAC encephalitis occur in the upper Midwestern states (Minnesota, Wisconsin, Iowa, Illinois, Indiana, and Ohio). Recently, more cases are being reported from states in the mid-Atlantic (West Virginia, Virginia and North Carolina) and southeastern (Alabama and Mississippi) regions of the country. It has long been suspected that LAC encephalitis has a broader distribution and a higher incidence in the eastern United States, but is under-reported because the etiologic agent is often not specifically identified.

LAC encephalitis initially presents as a nonspecific summertime illness with fever, headache, nausea, vomiting and lethargy. Severe disease occurs most commonly in children under the age of 16 and is characterized by seizures, coma, paralysis, and a variety of neurological sequelae after recovery. Death from LAC encephalitis occurs in less than 1% of clinical cases. In many clinical settings, pediatric cases presenting with CNS involvement are routinely screened for herpes or enteroviral etiologies. Since there is no specific treatment for LAC encephalitis, physicians often do not request the tests required to specifically identify LAC virus, and the cases are reported as aseptic meningitis or viral encephalitis of unknown etiology.
Also found in the United States, Jamestown Canyon and Cache Valley viruses are related to LAC, but rarely cause encephalitis.

Eastern Equine Encephalitis

Eastern equine encephalitis (EEE) is also caused by a virus transmitted to humans and equines by the bite of an infected mosquito. EEE virus is an alphavirus that was first identified in the 1930's and currently occurs in focal locations along the eastern seaboard, the Gulf Coast and some inland Midwestern locations of the United States. While small outbreaks of human disease have occurred in the United States, equine epizootics can be a common occurrence during the summer and fall.

It takes from 4-10 days after the bite of an infected mosquito for an individual to develop symptoms of EEE. These symptoms begin with a sudden onset of fever, general muscle pains, and a headache of increasing severity. Many individuals will progress to more severe symptoms such as seizures and coma. Approximately one-third of all people with clinical encephalitis caused by EEE will die from the disease and of those who recover, many will suffer permanent brain damage with many of those requiring permanent institutional care.

In addition to humans, EEE virus can produce severe disease in: horses, some birds such as pheasants, quail, ostriches and emus, and even puppies. Because horses are outdoors and attract hordes of biting mosquitoes, they are at high risk of contracting EEE when the virus is present in mosquitoes. Human cases are usually preceded by those in horses and exceeded in numbers by horse cases which may be used as a surveillance tool.

EEE virus occurs in natural cycles involving birds and *Culiseta melanura*, in some swampy areas nearly every year during the warm months. Where the virus resides or how it survives in the winter is unknown. It may be introduced by migratory birds in the spring or it may remain dormant in some yet undiscovered part of its life cycle. With the onset of spring, the virus reappears in the birds (native bird species do not seem to be affected by the virus) and mosquitoes of the swamp. In this usual cycle of transmission, virus does not escape from these areas because the mosquito involved prefers to feed upon birds and does not usually bite humans or other mammals.

For reasons not fully understood, the virus may escape from enzootic foci in swamp areas in birds or bridge vectors such as *Coquilletidia perturbans* and *Aedes sollicitans*. These species feed on both birds and mammals and can transmit the virus to humans, horses, and other hosts. Other mosquito species such as *Ae. vexans* and *Culex nigripalpus* can also transmit EEE virus.

When health officials maintain surveillance for EEE virus activity, this movement out of the swamp can be detected, and if the level of activity is sufficiently high, can recommend and undertake measures to reduce the risk to humans.

Western Equine Encephalitis

The alphavirus western equine encephalitis (WEE) was first isolated in California in 1930 from the brain of a horse with encephalitis, and remains an important cause of encephalitis in horses and humans in North America, mainly in western parts of the USA and Canada. In the western United States, the enzootic cycle of WEE involves passerine birds, in which the infection is inapparent, and culicine mosquitoes, principally *Cx. tarsalis*, a species that is associated with irrigated agriculture and stream drainages. The virus has also been isolated from a variety of mammal species. Other important mosquito vector species include *Aedes melanimon* in California, *Ae. dorsalis* in Utah and New Mexico and *Ae. campestris* in New Mexico.

Expansion of irrigated agriculture in the North Platte River Valley during the past several decades has created habitats and conditions favorable for increases in populations of granivorous birds such as the house sparrow, *Passer domesticus*, and mosquitoes such as *Cx. tarsalis*, *Aedes dorsalis* and *Aedes melanimon.* All of these species may play a role in WEE virus transmission in irrigated areas. In addition to *Cx. tarsalis, Ae. dorsalis and Ae. melanimon*, WEE virus also has been isolated occasionally from some other mosquito species present in the area. Two confirmed and several suspect cases of WEE were reported from Wyoming in 1994. In 1995, two strains of WEE virus were isolated from *Culex tarsalis* and neutralizing antibody to WEE virus was demonstrated in sera from pheasants and house sparrows. During 1997, 35 strains of WEE virus were isolated from mosquitoes collected in Scotts Bluff County, Nebraska.

Human WEE cases are usually first seen in June or July. Most WEE infections are asymptomatic or present as mild, nonspecific illness. Patients with clinically apparent illness usually have a sudden onset with fever, headache, nausea, vomiting, anorexia and malaise, followed by altered mental status, weakness and signs of meningeal irritation. Children, especially those under 1 year old, are affected more severely than adults and may be left with permanent sequelae, which is seen in 5 to 30% of young patients. The mortality rate is about 3%.

St. Louis Encephalitis

In the United States, the leading cause of epidemic flaviviral encephalitis is St. Louis encephalitis (SLE) virus. SLE is the most common mosquito-transmitted human pathogen in the U.S. While periodic SLE epidemics have occurred only in the Midwest and southeast, SLE virus is distributed throughout the lower 48 states. Since 1964, there have been 4,437 confirmed cases of SLE with an average of 193 cases per year (range 4 - 1,967). However, less than 1% of SLE viral infections are clinically apparent and the vast majority of infections remain undiagnosed. Illness ranges in severity from a simple febrile headache to meningoencephalitis, with an overall case-fatality ratio of 5-15 %. The disease is generally milder in children than in adults, but in those children who do have disease, there is a high rate of encephalitis. The elderly are at highest risk for severe disease and death. During the summer season, SLE virus is maintained in a mosquito-bird-mosquito cycle, with periodic amplification by peridomestic birds and *Culex* mosquitoes. In Florida, the principal vector is *Cx. nigripalpus*, in the Midwest, *Cx. pipiens pipiens* and *Cx. p. quinquefasciatus* and in the western United States, *Cx. tarsalis* and members of the *Cx. pipiens* complex.

Powassan Encephalitis

Powassan (POW) virus is a flavivirus and currently the only well documented tick-borne transmitted arbovirus occurring in the United States and Canada. Recently a Powassan-like virus was isolated from the deer tick, *Ixodes scapularis*. Its relationship to POW and its ability to cause human disease has not been fully elucidated. POW's range in the United States is primarily in the upper tier States. In addition to isolations from man, the virus has been recovered from ticks *(Ixodes marxi, I. cookei* and *Dermacentor andersoni*) and from the tissues of a skunk (*Spiligale putorius*). It is a rare cause of acute viral encephalitis. POW virus was first isolated from the brain of a 5-year-old child who died in Ontario in 1958. Patients who recover may have residual neurological problems.

Venezuelan Equine Encephalitis

Like EEE and WEE viruses, Venezuelan equine encephalitis (VEE) is an alphavirus and causes encephalitis in horses and humans and is an important veterinary and public health problem in Central and South America. Occasionally, large regional epizootics and epidemics can occur resulting in thousands of equine and human infections. Epizootic strains of VEE virus can infect and be transmitted by a large number of mosquito species. The natural reservoir host for the epizootic strains is not known. A large epizootic that began in South America in 1969 reached Texas in 1971. It was estimated that over 200,000 horses died in that outbreak, which was controlled by a massive equine vaccination program using an experimental live attenuated VEE vaccine. There were several thousand human infections. A more recent VEE epidemic occurred in the fall of 1995 in Venezuela and Colombia with an estimated 90,000 human infections. Infection of man with VEE virus is less severe than with EEE and WEE viruses, and fatalities are rare. Adults usually develop only an influenza-like illness, and overt encephalitis is usually confined to children. Effective VEE virus vaccines are available for equines.

Enzootic strains of VEE virus have a wide geographic distribution in the Americas. These viruses are maintained in cycles involving forest dwelling rodents and mosquito vectors, mainly *Culex* (*Melanoconion*) species. Occasional cases or small outbreaks of human disease are associated with there viruses, the most recent outbreaks were in Venezuela in 1992, Peru in 1994 and Mexico in 1995-96.

Other Arboviral Encephalitides

Many other arboviral encephalitides occur throughout the world. Most of these diseases are problems only for those individuals traveling to countries where the viruses are endemic.

Japanese Encephalitis

Japanese encephalitis (JE) virus is a flavivirus, related to SLE, and is widespread throughout Asia. Worldwide, it is the most important cause of arboviral encephalitis with over 45,000 cases reported annually. In recent years, JE virus has expanded its geographic distribution with outbreaks in the Pacific. Epidemics occur in late summer in temperate regions, but the infection is enzootic and occurs throughout the year in many tropical areas of Asia. The virus is maintained in a cycle involving culicine mosquitoes and waterbirds. The virus is transmitted to man by *Culex* mosquitoes, primarily *Cx. tritaeniorhynchus*, which breed in rice fields. Pigs are the main amplifying hosts of JE virus in peridomestic environments.

The incubation period of JE is 5 to 14 days. Onset of symptoms is usually sudden, with fever, headache and vomiting. The illness resolves in 5 to 7 days if there is no CNS involvement. The mortality in most outbreaks is less than 10%, but is higher in children and can exceed 30%. Neurologic sequelae in patients who recover are reported in up to 30% of cases. A formalin-inactivated vaccine prepared in mice is used widely in Japan, China, India, Korea, Taiwan and Thailand. This vaccine is currently available for human use in the United States, for individuals who might be traveling to endemic countries.

Tick-Borne Encephalitis

Tick-borne encephalitis (TBE) is caused by two closely related flaviviruses which are distinct biologically. The eastern subtype causes Russian spring-summer encephalitis (RSSE) and is transmitted by *Ixodes persulcatus*, whereas the western subtype is transmitted by *Ixodes ricinus* and causes Central European encephalitis (CEE). The name CEE is somewhat misleading, since the condition can occur throughout much of Europe. Of the two subtypes, RSSE is the more severe infection, having a mortality of up to 25% in some outbreaks, whereas mortality in CEE seldom exceeds 5%.

The incubation period is 7 to 14 days. Infection usually presents as a mild, influenza-type illness or as benign, aseptic meningitis, but may result in fatal meningoencephalitis. Fever is often biphasic, and there may be severe headache and neck rigidity, with transient paralysis of the limbs, shoulders or less commonly the respiratory musculature. A few patients are left with residual paralysis. Although the great majority of TBE infections follow exposure to ticks, infection has occurred through the ingestion of infected cows' or goats' milk. An inactivated TBE vaccine is currently available in Europe and Russia.

West Nile Encephalitis

Discussed elsewhere in this document

FLD 44 BLOODBORNE PATHOGENS EXPOSURE CONTROL PLAN - FIRST AID PROVIDERS

RELATED FLDs

FLD 43 – Biological Hazards
FLD 45 – Bloodborne Pathogens Exposure Control Plan – Work with Infectious Waste

INTRODUCTION

Bloodborne pathogens are pathogenic microorganisms which may be present in human blood and can cause disease in humans. These pathogens include, but are not limited to hepatitis B virus (HBV) and human immunodeficiency virus (HIV). The Occupational Safety and Health Administration (OSHA) requires compliance with 29 CFR 1910.1030, Occupational Exposure to Bloodborne Pathogens Standard where, as a condition of employment, there is known or potential exposure to bloodborne pathogens. A source of occupational exposure may occur when an employee gives First Aid and CPR to an individual who has infectious blood and the potentially infectious materials come in contact with the employee's eyes, mucous membranes, non-intact skin through cuts and abrasions.

Additional sources of exposure are contact with infectious waste found at hazardous waste sites; glassware, needles, and other sharp objects which have been involved in injuries to personnel resulting in contamination with blood or related bodily fluids; and laboratory personnel who may analyze samples containing infectious waste. FLD 45 provides a separate Bloodborne Pathogens Exposure Control Plan for Work with Infectious Waste.

In July 1992, OSHA issued a final Standard for Protection of Workers Potentially Exposed to Bloodborne Pathogens (29 CFR 1910.1030). This standard primarily involves medical and research personnel and their exposure to blood or blood-containing fluids infected with Bloodborne Pathogens. The HIV and HBV pathogens could potentially be present in viable states at emergency response sites and infectious or hazardous waste sites, with hepatitis virus being the more likely to survive in temperatures outside the body temperature ranges. Another potential for exposure would be from workers who could be infected. The OSHA Standard specifically includes first aid providers among workers covered by this standard.

WESTON's Corporate Environmental, Health, and Safety (CE&HS) Director is responsible for managing this Exposure Control Plan (ECP). WESTON's Division Environmental, Health, and Safety Managers (DEHSMs) will provide technical guidance and assistance in review and implementation.

This ECP is available on the WESTON EHS Portal site.

SCOPE

WESTON personnel do not provide medical assistance as a primary job duty, however, this Bloodborne Pathogen ECP is applicable to designated first aid providers. Weston workers expected to administer first aid must have a basic understanding of bloodborne pathogens in order to protect themselves effectively from any hazards. At a minimum, this Bloodborne Pathogen ECP for First Aid Providers will be on site and implemented for each project.

WESTON personnel may deliver First Aid and CPR in a nonclinical setting. First Aid and CPR duties are often performed in uncontrolled environments, which, due to a lack of time and other factors, do not allow for application of a complex decision-making process to the emergency at hand.

This ECP is intended to assist personnel in making decisions concerning the use of personal protective equipment (PPE) and resuscitation equipment, as well as for decontamination, labeling, containerizing and disposal procedures.

Information Program

Completion of health and safety plans (HASP) requires identification and assessment of risk from exposure to biological hazards. This ECP deals with forms of infection that are of concern to workers who can come in contact with bodily fluids associated with blood.

WESTON training programs will provide information on bloodborne pathogens and the Occupational Exposure to Bloodborne Pathogens Standard to all field personnel with special emphasis on those employees who may be certified and called upon to perform First Aid.

Exposure Control

This ECP is designed to eliminate or minimize employee exposure to bloodborne pathogens through information and training, use of PPE, safe handling procedures, decontamination, and proper disposal methods.

Exposure Determination

Employees certified in First Aid and CPR may be at risk from bloodborne pathogens when these services are rendered. Attachment 1 identifies tasks in which occupational exposure may occur, potential contact, and required protective measures for First Aid providers.

METHODS OF COMPLIANCE

Universal Precautions

When treating a victim for an injury, conducting CPR, or handling potentially infectious waste, the use of universal precautions is the recommended approach to infection control. Universal precautions assume all human blood and certain human body fluids are infectious for HIV, HBV and other bloodborne pathogens. Other body substances, including feces, urine, or vomit are not included, unless they contain visible blood. Under circumstances in which differentiation between body fluid types is difficult or impossible, all body fluids shall be considered potentially infectious materials.

Work Practice Controls

Work practice controls reduce the likelihood of exposure by formalizing the manner in which a task is performed.

- All first aid procedures involving blood or other potentially infectious materials shall be performed in a manner that minimizes splashing, spraying, spattering, and generation of droplets of these substances.
- Mouth suctioning of blood or other infectious materials is prohibited.
- When handling sharps such as needles used for bee stings or diabetes, do not recap, purposely bend, break by hand, remove from disposable syringes, or otherwise manipulate by hand.
- As soon as possible after use, contaminated sharps are to be placed in puncture proof/leak proof containers until they can be disposed.

- Broken glassware which may be contaminated shall not be picked up directly with the hands unless gloves are used to protect the hands against cuts. It is best to use mechanical means, such as a brush and dust pan then place contaminated broken glass in a puncture proof/leak proof container.
- When handling red bag waste, hold the top end of the bag rather than the bottom.
- Containers of potentially infectious waste should be labeled with a biohazard label.
- All PPE should be inspected prior to use. PPE should not be worn if the PPE barrier is compromised.
- Hands and other skin surfaces should be washed immediately and thoroughly if contaminated with blood, other body fluids to which universal precautions apply, or their potentially contaminated articles. Hands should always be washed after gloves are removed even if the gloves appear intact.
- Where hand washing facilities are not readily accessible, an antiseptic hand cleaner along with clean cloth/paper towels or antiseptic towelettes should be used. When antiseptic hand cleaners or towelettes are used hands shall be washed with soap and running water as soon as feasible.

Engineering Controls

Engineering controls isolate or remove the bloodborne pathogen hazard from the workplace.

- Proper containerizing, labeling and disposal of contaminated items are required for all potentially infectious waste.
- Minimizing needle sticks by placing them in a puncture proof container.
- Limiting access or close off areas which contain potentially infectious materials.

Administrative Controls

Administrative controls reduce or eliminate bloodborne pathogen hazards from the workplace by program development (i.e., ECP), auditing to ensure these programs are in place and implemented, and providing information and training.

Personal Protective Equipment (PPE)

PPE is specialized clothing or equipment worn by an employee for protection against a hazard. Attachment 1 provides examples of recommendations for PPE in the nonclinical setting; the list is not intended to be all-inclusive.

First-aid kits will be supplemented with bloodborne pathogen kits or supplies and will be readily accessible at all times. The CEH&S Department maintains a list of the minimum content of bloodborne pathogen PPE kits or supplies. The list is accessible on the EHS Portal Site.

If the chance of being exposed to blood is high, the caregiver should put on protective attire before beginning CPR or First Aid. Protective barriers should be used in accordance with the level of exposure encountered.

Under rare or extraordinary circumstances, a responding employee may decide, based on his or her judgment, that use of PPE would prevent delivery of care or pose an increased hazard to safety of the employee or co-worker. When this judgment has been made, an investigation of the event will be initiated and documented in order to determine what changes in procedures or protective equipment is needed.

Resuscitation Equipment

No transmission of HBV or HIV infection during mouth to mouth resuscitation has been documented. However, because of the risk of salivary transmission of other infectious diseases and the theoretical risk of HIV and HBV transmission during artificial ventilation of trauma victims, disposable mouth to mouth resuscitation masks (one-way valve type only) should be used. These devices are designed to isolate emergency response personnel from contact with victim's blood and blood-contaminated saliva, respiratory secretions, and vomit. Disposable resuscitation equipment and devices should be disposed of once they have been used.

Decontamination and Disposal

All PPE will be removed prior to leaving a contaminated area and secured properly for decontamination or proper disposal.

Decontamination uses physical or chemical means to remove, inactivate, or destroy bloodborne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal. All spills of blood and blood-contaminated fluids should be promptly cleaned up. The area should be decontaminated with a commercial disinfectant solution or a 1:100 solution of household bleach. Soiled cleaning equipment should be cleaned and decontaminated with the disinfectant solution.

If a victim's clothes become soiled with blood during First Aid or CPR, the soiled material (i.e., clothes, resuscitation equipment or disposable towels) should be placed in a red or orange plastic bag. If possible this bag should accompany the victim to the hospital or ambulance. Where on-site emergency care is given and additional medical treatment is not likely, soiled material should be placed in a red or orange plastic bag and then pick-up should be arranged by a local medical waste disposal company. Containers must be identified prior to transport or pick-up.

Any questions regarding the disposal or management of soiled garments or materials should be directed to CE&HS or the applicable DEHSM.

Containerizing

The potentially contaminated materials and sharps container generated from giving First Aid and CPR will be placed in a red or orange container/bag. When PPE is removed it shall be placed in an appropriate designated area for containerization. If the outside contamination of the primary container occurs, the primary container shall be placed within a second container which prevents leakage during handling processing storage, transport or shipping and is labeled or color coded.

Sharps such as needles used for bee stings or diabetes should be placed in a puncture proof/leak proof color coded or labeled container. If other contents could puncture the primary container, the primary container shall be placed within a secondary container which is puncture resistant. The liquid generated from the decontamination process should be contained in a leak proof container until a local medical waste disposal company can provide information on proper disposal based on local, state and federal regulations.

Labeling and Hazard Communication

Biohazard warning labels required by the Standard [29 CFR 1910.1030(g)(1)(i)(B)] must be attached to containers of regulated wastes or other containers of potentially infectious materials during storage, transport or shipment. Red or orange bags may be substituted for labeling requirements, otherwise, a biohazard label with lettering or symbols should be affixed to the outside of each bag or container generated. Consequently, any container so labeled or any red or orange bagged waste or materials shall be considered to contain either blood or other infectious material.

Incident Reporting

When an employee gives First Aid or CPR, or is potentially exposed to a bloodborne pathogen, a Notification of Incident (NOI) Report must be completed. The report must indicate "Potential Exposure to Bloodborne Pathogens". Additionally, the employee will acknowledge potential exposure to bloodborne pathogen on the Monthly Employee Health and Safety Report.

Vaccination and Post-Exposure Evaluation and Follow-up

The pre-work Hepatitis B Vaccination for First Aid providers is not required, it will therefore, be offered post-exposure.

Hepatitis B vaccines are effective in preventing hepatitis B following a documented exposure when given within 1 week after HBV exposure. The vaccine may be more effective when combined with HBIG, a preparation of immune globulin with high levels of antibody to HBV (anti-HBs). The U.S. Public Health Service and Center for Disease Control guidelines should be accessed for current information.

Upon suspicion or verification of exposure to blood or infectious materials, Hepatitis vaccine will be made available to the exposed individual(s) at no cost to the employee. The employee will immediately be referred to WESTON's Occupational Medical Consultant (OMC) for counseling and management.

In the event the employee declines the Hepatitis B vaccine the Hepatitis B Vaccine Declination form (Attachment 2) must be completed and filed with CE&HS and the OMC.

Upon learning of exposure to a source or source individual found to be positive for HBV or HIV, WESTON's OMC will provide direction on case management. The OMC, after discussion of the exposure situation with the medical clinic or hospital where the victim was evaluated and treated for injury, will determine whether the exposed employee should be tested for HBV or HIV prior to the status of the source being known (or in the case where the source is unknown).

HBV and HIV testing of the source individual should be done at the local offices' medical clinic or at the hospital where the victim was treated for injury. Local laws may apply for testing source individuals in situations where consent cannot be obtained because the source refuses testing or cannot be identified (i.e., an unconscious patient). If the job location does not allow access to the local offices' medical clinic then a new WESTON OMC will be consulted for guidance. The alternate clinic/hospital must offer pretest counseling, post test counseling and referral for treatment.

Consult with WESTON's OMC to determine if the exposed employee should be given the HBV post-exposure vaccination.

Collection and testing of blood for HBV and HIV serological status shall be performed as soon as feasible on the exposed employee's blood (after consent) where the source is found to be positive for HIV or

HBV. Results of the source individual's testing shall be made available to the exposed employee, and the employee shall be informed by CEHS and/or the OMC of applicable laws and regulations concerning disclosure of the identity and infectious status of the source individual. When the source individual is already known to be infected with HBV or HIV testing of the source individual known HBV or HIV status need not be repeated (Center for Disease Control, 1985).

If the source of the exposure is a needle stick or bloodstained material (i.e., blood stained material contacted an open wound on a field team member) the source should be placed in an appropriate container (i.e., sharps container for needles and red bag for blood tainted material). The container should be given to the WESTON medical clinic for analysis. If the source is found to be HBV or HIV positive, the incident report must be updated to change the status from suspected to confirmed exposure. At this point the NOI Report will be placed in a limited control access portion of incident filing system to maintain confidentiality.

Human Immunodeficiency Virus Post Exposure Management

For any exposure to a source or source individual who has AIDS, who is found to be positive for HIV infection or who refuses testing, the worker should be counseled regarding the risk of infection and evaluated clinically and serologically for evidence for the HIV infection as soon as possible after the exposure. WESTON's OMC will provide direction on the case management.

If the source individual was tested and found to be seronegative, follow-up will be determined by WESTON's OMC.

If the source or source individual cannot be identified, decisions regarding appropriate follow-up should be individualized. Serological testing will be made available to all workers who may be concerned they have been infected with HIV through an occupational exposure. WESTON's OMC will provide direction on the case management.

Communication of Hazards to Employees

<u>Training Schedule</u>

WESTON ensures that employees, who are certified to provide First Aid and CPR, are trained in all components of the bloodborne pathogen standard upon assignment and at the annual refresher training. All First Aid providers must be aware of task modifications or procedure changes which might affect occupational exposure.

<u>Training Contents</u>

A training sign-up sheet will be completed to include course title, date, attendees' names, signatures, job classifications, instructor's name, and duration of the class. Training content will include the following information:

- Where an accessible copy of the regulatory text and the WESTON's ECP can be found.
- An explanation of WESTON's ECP and the means by which employees can obtain a copy of the written plan.
- A general explanation of the epidemiology and symptoms of bloodborne diseases.
- An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials.

- An explanation of the use and limitations of methods that will prevent or reduce exposure including appropriate engineering controls, work practices, and PPE.
- Information on the types, proper use, location, removal, handling, decontamination and disposal of PPE.
- An explanation of the basis for selection of PPE.
- Information on the Hepatitis B vaccine (or any new vaccines), including information on its efficacy, safety, method of administration, the benefits of being vaccinated.
- An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available.
- Information on the post-exposure evaluation and follow-up that WESTON is required to provide for the employee following an exposure incident.
- An explanation of the signs and labels and/or color coding for disposal of infectious materials.
- An opportunity for interactive questions and answers with the person conducting the training session.

Recordkeeping

When an employee gives First Aid or CPR and in doing so becomes subject to this ECP, he/she will verbally report the incident according to WESTON's Operating Practices and then as soon as possible complete a WESTON NOI Report. As part of a medical record, the circumstances of exposure will be kept confidential. Relevant information includes the activities in which the worker was engaged at the time of exposure, the extent to which appropriate work practices and PPE were used, and a description of the source of exposure (USHHS and NIOSH, 1989). When the source is tested for HIV or HBV, the incident report is updated and placed in a confidential file.

Dates

This Exposure Control Plan was revised effective March 2008.

ATTACHMENT 1
TASK IDENTIFICATION, POTENTIAL CONTACT, AND PROTECTION

CPR AND FIRST AID			
EMERGENCY SITUATION	**SERVICE**	**POTENTIAL CONTACT**	**PPE SUGGESTED**
Victim is lying on the ground	Primary survey of victim and opening victims airway	Skin to skin contact	Gloves
Victims breathing has ceased	Rescue breathing	Skin to skin contact Mouth to mouth contact	Gloves Resuscitation mouthpiece
No pulse	CPR	Skin to skin contact	Gloves Resuscitation mouthpiece
Victim is lying on the ground	Secondary survey of victim	Skin to skin contact	Gloves
Choking without stoppage of breathing	Heimlich maneuver	Skin to skin contact	None required if skin is intact Non-intact skin requires gloves
Heart Attack	Comfort victim	Skin to skin contact	Gloves
Bleeding with spurting blood	External control	Skin to skin contact	Gloves Gown or coveralls Apron (option) Mask or face protection Eyewear
Minimal bleeding	External control	Skin to skin contact	Gloves
Compound fractures	External control	Skin to skin contact	Gloves
Burns	External control	Skin to skin contact	Gloves
Poisoning	If induced vomiting is needed	Skin to skin contact	Gloves Eyewear
Diabetic shock	Giving an injection	Sharps from needle could cause direct injection	Gloves Sharps container
Bites and stings	Giving an injection	Sharps from needle could cause direct injection	Gloves Sharps container
Seizures	External control	Eyes and skin contact	Gloves Eyewear

CPR AND FIRST AID			
EMERGENCY SITUATION	**SERVICE**	**POTENTIAL CONTACT**	**PPE SUGGESTED**
Stroke	Provide comfort	None	Gloves
Heat Stress/Cold Stress	External control	Skin to skin contact	Gloves
Victim has fainted	Raise legs for shock	Skin to skin contact	Gloves
Victim falls down in hazardous atmosphere	Rescue victim from area	Skin to skin contact	Gloves
Soiled clothes handling	Place soiled clothing and materials in red/orange bag	Skin contact with bloodborne pathogens in clothing fabrics	Gloves Gown or apron (as needed)
Decontamination	Scrub with disinfectant	Skin contact with bloodborne pathogens in clothing fabrics	Gloves Gown or apron (as needed)
Containerization	Place contaminated clothing into bags	Potential skin contact with residual bloodborne pathogen on bags	Gloves Gown or apron (as needed)

ATTACHMENT 2
DECLINATION OF VACCINATION
(29 CFR 1910.1030, APPENDIX A)

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to myself. However, I decline hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

Employee Signature ______________________ Date ____________

Employee Name (Print) ______________________

Employee Number ______________________

Safety Officer Signature ______________________ Date ____________

A copy of this form will be maintained in the employees medical file, a copy given to the employee, and the original forwarded to the OMC.

APPENDIX D
DATA MANAGEMENT PLAN

		Site-Specific Data Management Plan			
		Project Name:	Haystack AUM No. 1	**TDD Number/Site ID:**	0002/1302-T2-R9-14-07-0001
		Author:	Ian Bruce	**Company:**	WESTON Solutions
		Date Initiated:	July 28, 2014	**Last Updated:**	August 1, 2014
Viewer:	https://epar8gis.net/REGION9/NavajoOperationalViewer/ OR http://epaosc.org/site/map_list.aspx?site_id=*pending* (OSC Interface)				

This data management plan (DMP) is intended to provide guidance for data collection by field personnel and subsequent data management activities. The data collection and management practices presented in this plan are designed to ensure data integrity and consistency for all data collection personnel and from operational period to the next. This document is intended to be used in conjunction with a Region wide data management plan and only includes the details specific to the site.

Data Processing - The following table outlines the specific requirements for various data types being collected during the project.

	Data Input (Input Device)	Data Type	Data Source	Target Database	Site Specific Data Elements	Site Specific Verification	Site Specific SOP
1	Site Information (iPad – FileMaker, Garmin GLO)	Site Info	WESTON Field Team	Scribe	Yes	Yes, R9 Auditor Rules (*pending*)	SAP
2	Site Photographs (iPad – FileMaker, Garmin GLO, PhotosInfoPro)	Site Info	WESTON Field Team	EPA OSC	Yes	Yes, R9 Auditor Rules (*pending*)	SAP
3	Site Spatial Data (iPad – Collector, Garmin GLO, Trimble GeoXT)	Site Info	WESTON Field Team	Region 9 SQL Server	Yes	Yes, R9 Auditor Rules (*pending*)	SAP
4	Surface Soil Radiation Survey (Radiation Go Kit, Gateway, Ludlum 2241 Meter, Ludlum 44-20 Probe, Trimble GeoXT)	Assessment	EPA Region 9 ERT	Viper	Yes	No	ERT 2012
5	Surface Soil Radiation Grab Sampling (iPad – FileMaker, Ludlum Model 19 Meter, Ludlum 44-9 Probe)	Soil Sampling	WESTON Field Team	Scribe	Yes	No	SAP
6	Subsurface Soil Radiation Survey (Geoprobe, iPad – FileMaker, Ludlum 2241 Meter, Ludlum 44-62 Probe)	Assessment	WESTON Field Team	Scribe	Yes	No	SAP
7	Subsurface Soil Sampling (Geoprobe)	Soil Sampling	WESTON Field Team Analytical Laboratory	Scribe	Yes	Yes, R9 Auditor Rules (*pending*)	SAP
8	Dust and Particulates Air Monitoring (PDR-1000AN)	Monitoring	WESTON Field Team	Scribe	None	Yes	None

Data Reporting - The following table outlines the specific requirements for various data reports being distributed during the project.

	Reporting Task	Data Inputs	Data Transformation	Deliverable Format(s)	Frequency
1	Surface Soil Radiation Monitoring	3	Publish	Viper Deployment, Flex Viewer via OSC Interface	1-minute Intervals
2	Soil Sampling Progress	2, 4, 5	Publish	Flex Viewer via OSC Interface	15-minute Intervals
3	Assessment Report	1 - 7	Comprehensive event documentation and summary	PDF Document	Project Completion
4	Data Export (Backup)	1, 2, 4, 5	Export / Publish	Raw Data Format	Daily
5	Calibration Log	2 – 5, 7	Transcribe	Spreadsheet	Project Completion

ATTACHMENTS

A. Generic Document: Description pending